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ABALONE-ENDANGERED SPECIES

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TALE OF A SEA DRAGON

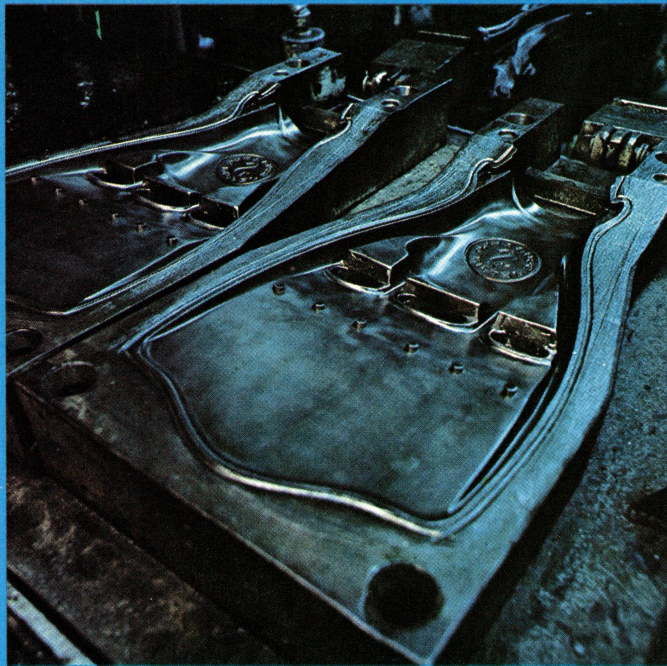
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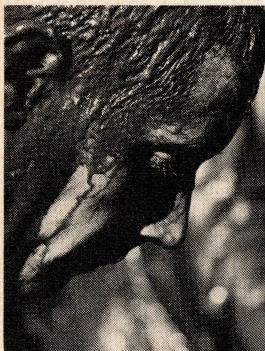
CO₂ cartridge detonator with large safety pull.

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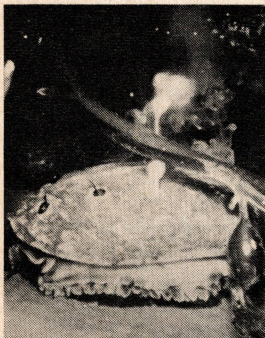


skin diver

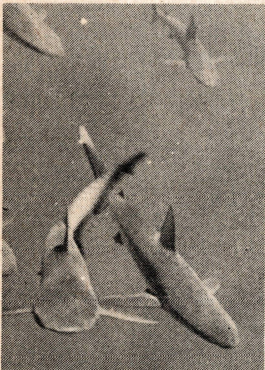
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Cover—While hanging on a decompression line, Al Giddings began experimenting with a pastime that promises to be the latest diving fad—blowing air rings. To learn how, see story on Page 46. Photo by Paul J. Tzimoulis.

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qualities of the sea. If you're going to explore underwater caves or sunken ships, our 15mm f2.8 ultra wide angle Nikkor is for you. This lens, too, is specifically designed for use underwater.

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Within any environment, there is a smaller world of intrigue and fascination waiting to be discovered. The Nikonos Closeup Outfit takes you within inches of colorful coral or face to face with a starfish. You can get up to 1/2 life-size reproduction. The Closeup Outfit is made by Nikon with the same precision and durability as all Nikonos system components.

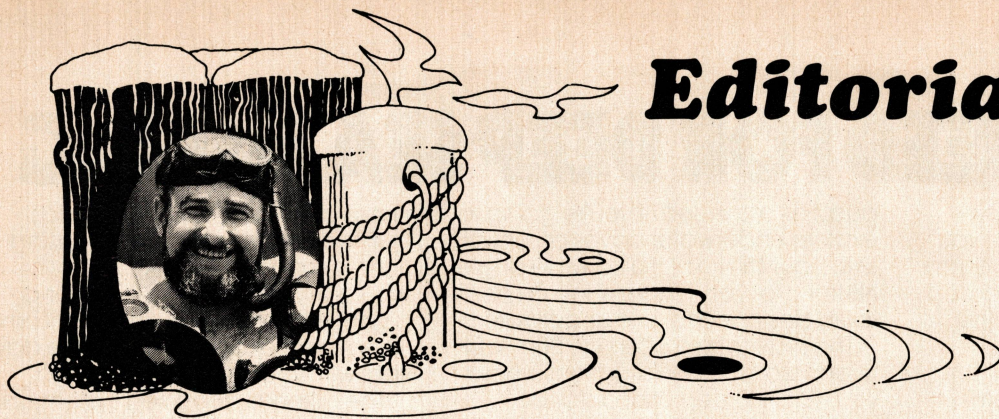
Underwater, darkness follows depth. If your dives take you deep, or if you have an eye for the unknown, hidden

areas of the sea, the Nikonos flash gun is a must. For that matter, using flash is a good idea regardless of where you dive. It livens color and highlights details that you might otherwise miss. It enables you to take daylight with you as deep as you go.

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NIKONOS II





Editorial

TAKE FIVE . . .

by the Publisher

As diving activities become more sophisticated, we find ourselves in need of a better working knowledge about decompression tables and procedures. This is evidenced by the growing number of decompression aids now available on the American market. Sport divers are going deeper, staying longer, and becoming more vulnerable to bends than ever before. It is quite possible that bends may become the greatest safety problem facing us in the next few years.

During recent discussions with such equipment developers as Hannes Keller and Ralph Shamlian, a very interesting point about the decompression tables came to light. It is now believed that the NO DECOMPRESSION TABLE is potentially the most dangerous of all decompression tables if abused or improperly applied. Up to now, it had been considered the safest by most sport divers and instructors.

The danger in the NO DECOMPRESSION TABLE lies in the fact that a diver who follows this table ascends to the surface without taking any decompression stops at all. If he has made any sort of error in bottom time computation, or has pushed his dive beyond the limits, the chances for a bends hit is greater than with the diver who has made a deeper/longer dive and took some decompression at the required stops. As Keller so aptly stated, "Some decompression time is better than none at all."

To better explain the problem, let's go back a few steps to the source of the NO DECOMPRESSION TABLE. When the U.S. NAVY STANDARD AIR DECOMPRESSION TABLE was developed years ago, the Navy conservatively estimated a built-in error of five percent. This meant that an estimated five out of every 100 Navy divers who followed the table to the letter would still be bent, due to the wide variance

in individual human physiology. Subsequent reviews of logged dives by Navy divers (computer analysis) has revealed only a .6 percent error factor. However, it must be remembered that this reduction in the error factor is based on Navy divers, who were pre-scanned for medical problems, age, health, etc. There is no compiled data available on civilian divers.

Another very important factor is rate of ascent. The U.S. NAVY STANDARD AIR DECOMPRESSION TABLE is only valid if the diver precisely follows the 60 feet per minute rate of ascent. This procedure is a vital part of the whole procedure. Coming up too fast or too slow changes the whole ball game, and invalidates the schedule being followed.

Since the NO DECOMPRESSION TABLE is based on the STANDARD AIR DECOMPRESSION TABLE, it is bound by the very same rules, procedures, and built-in error factors. It certainly is no safer or no different than the STANDARD TABLE. In fact, the title "NO DECOMPRESSION" is a misnomer, since you are most certainly decompressing while using this table. It would have been less misleading if this table were titled, "NO STOP DECOMPRESSION TABLE."

Unlike the Navy diver, today's sport diver does not have all the trimmings which go along with the DECOMPRESSION TABLES. There is no timekeeper to precisely measure each diver's descent time, bottom time, ascent time, and decompression stop time. There is no medical doctor to examine him prior to the dive, and there is no recompression chamber standing by in case of accident or error.

For example, it has been observed that most sport divers fail to follow the prescribed ascent rate of 60 feet per minute. They have no way or instrument for gauging ascent speed, and invariably come up too fast. This is

one of the key problems in using the "NO DECOMPRESSION TABLE."

Too many sport divers apply the NO DECOMPRESSION TABLE incorrectly by not adding their descent time to the total bottom time limit. For example, it takes two full minutes to reach a depth of 150 feet, if you follow the prescribed descent rate of 75 feet per minute. The NO DECOMPRESSION limit at this depth is five minutes. When you subtract the descent time, it leaves only three minutes at this depth . . . not five minutes.

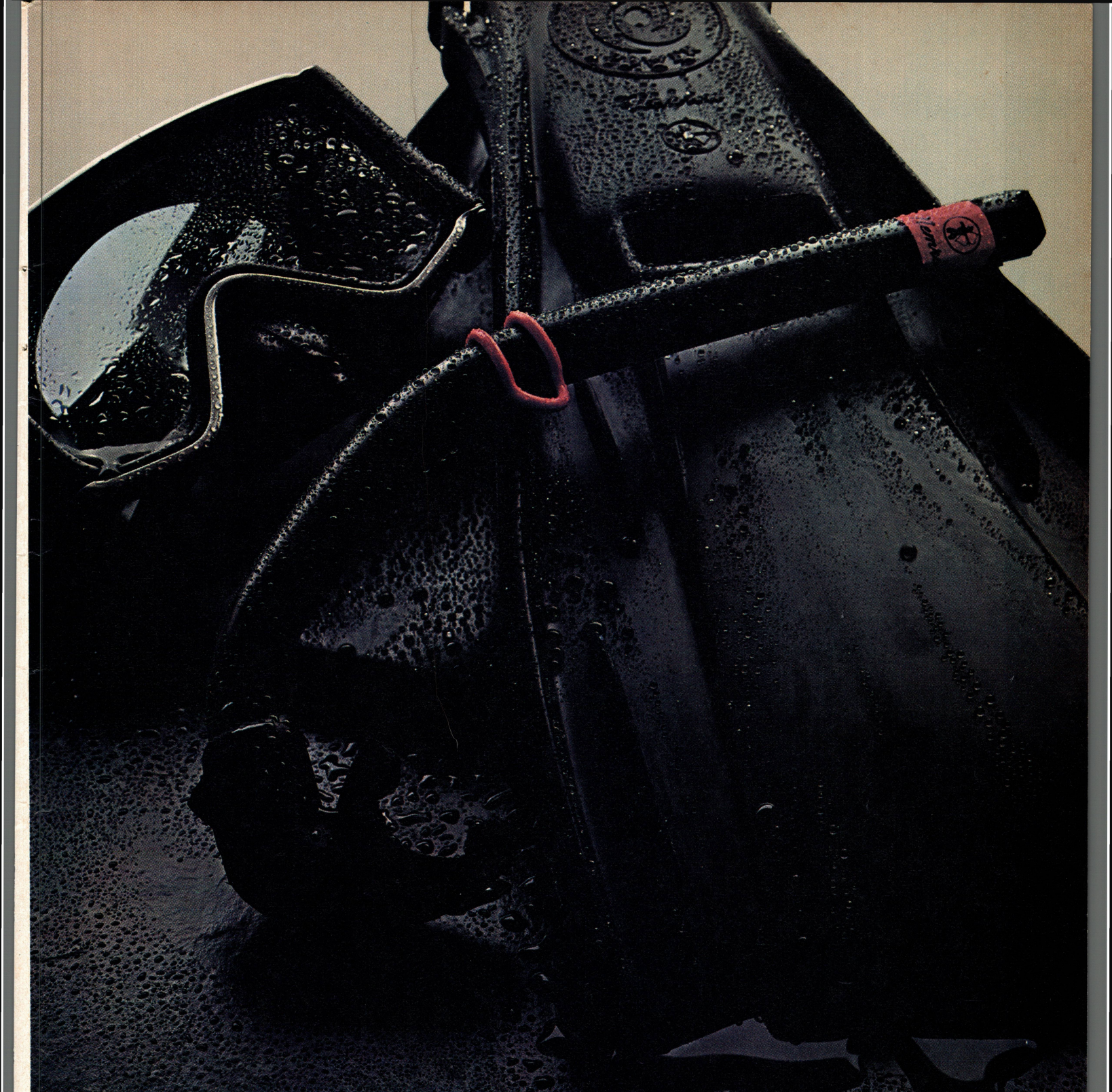
Far too many sport divers are playing the NO DECOMPRESSION TABLE too close to its absolute limit. They leave themselves no safety margin for personal error or unforeseen emergencies. Was the watch bezel precisely set at the start of the dive? Was the bezel bumped or moved somehow during the dive? Is the depth gauge really accurate at depth? It's these little things which can get a diver in trouble, and help to push him beyond the safe limit.

Furthermore, few sport divers realize how increased depth can amplify the danger factor. For example, a one or two minute error in bottom time computation at a depth of 90 feet could get you bent. But at a depth of 150 feet, the margin for error might be just a few seconds. The deeper you go, the more critical the timing. And yet the deeper you go, the less likely you will be able to function precisely because of the dulling, numbing effect of nitrogen narcosis.

How can you utilize the NO DECOMPRESSION TABLE safely? Follow these steps and you may save yourself a lot of possible trouble and pain:

- a) Be sure your watch is precisely set at the start of the dive and that your depth gauge is functioning accurately. Do not depend solely on

(Continued on Page 27)



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... Do any of your readers know, approximately, how many active female commercial divers there are? I am interested in contacting only those who are directly involved in the construction field underwater.

If there are any, I would like to contact them. I've been in U/W construction now for almost 14 years.

Don't just sit there. Let's hear from you.

JOAN A. BARKER

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... I have enjoyed with great pleasure all the issues of SKIN DIVER I have read since first subscribing to your fine magazine in 1967. I have also started a collection of SKIN DIVER's dating back only as far as 1958.

I still wait with high enthusiasm for the arrival of every new issue, being a U.S. Navy diver, as I did after reading my first issue some years ago. SKIN DIVER and I being born at the same time have grown to regard scuba diving as much more than a sport, but rather a way of life.

At this time after just renewing my subscription for three years allow me to salute your magazine for its professionalism in regard to the sport of diving and for the concern shown for the betterment of our sport as well as for the element we dive in. Keep up the good work.

EUGENE F. MUCHANSKI

USS FLYING FISH

Thanks Eugene . . . we needed that!

... Capt'n Don asked me to tell you in regards to your article on "Coral Gougers" (March 1974) that the government of Bonaire, N.A., has more than set regulations on coral collecting. It has since 1970, in conjunction with the Capt'n, banned any type of coral collecting or molesting any of the reefs in any form including all of its inhabitants (except the Capt'n himself). We even ask the divers to use tinted mask lenses so not to abrade the corals with their hungry vision.

A. BRUCE BOWKER

AQUAVENTURE, BONAIRE, N.A.

... Couldn't help recognizing the after deck and hatch of the *Caridad* on pages 20-21 of February 1974 SKIN DIVER. The deck isn't in as good shape these days, the constant pounding of

skin diver

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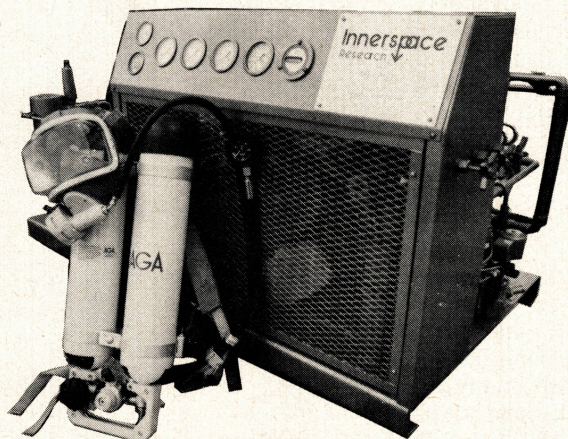
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the southeasterly swells have weakened it. The winch in the upper right hand corner has broken from its mounts and tumbled down. The mast no longer projects from the water but all in all the *Caridad* has fared very well for its four years underwater. I'm sure its load of cement has helped stabilize the vessel.

It would be good to have SKIN DIVER back down here in the Virgin Islands to photograph the changes in the over and underwater environment. Lagoon Undersea Centre has grown to include facilities at Limetree Beach, Bolongo Bay, Frenchman's Reef, Morningstar Beach Hotels on St. Thomas and San Juan Holiday Inn on Puerto Rico. We now have a greatly expanded dive program, power and sail boat rentals, equipment rental, guided tours and general all in all good fun diving. We are also diving on the *Rhone* as well as the *Caridad*, the two wrecks covered in SKIN DIVER plus Stevens, Congo, Little St. James, Frenchcap Cays also mentioned in your magazine. Come visit us soon.

WILLIAM W. HOWE III

ST. THOMAS, V.I.

DIVER DESIGNS by DIMENSION 2



1



2



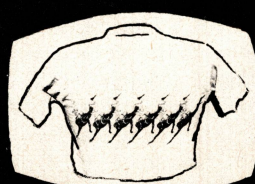
3



4



5



6

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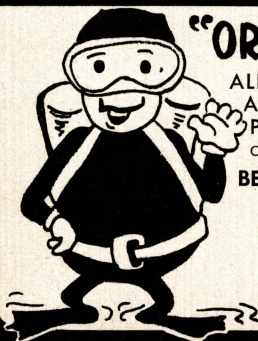
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DEALER INQUIRIES ENCOURAGED!



... Letters to the editor are a pain, but relative to your editorial on chambers of March 1974 ... is the fact that Micronesia, she of the fabulous soft corals and sunken ships, has two operative chambers. One of those is at the McDonald Memorial Hospital in Koror, Palau, and the other at the Truk District hospital on Moen. More, the crew at the Truk hospital just saved the life of a very badly bent Micronesian and in the process were forced to run a table four to do it. Pretty tough for your first assignment, and we are proud of them — thumbs and all. There are many procedures to be ironed out, but they can do a job.

JOHN U. OAKES

MARINE RESOURCES DIVING
OFFICER, TRUST TERRITORY OF
THE PACIFIC ISLANDS

... I am a South African at present working in America, and have been most amazed and disgusted at the bastardization of the two great sports of scuba diving and skin diving that I have seen here. At home, the two remain divorced and totally independent from one another, and it is an un-

(Continued on Page 17)

THE PENNY PINCHER

INTRODUCING THE **MARK 25**

BUILT FOR PROFESSIONALS
BY PROFESSIONALS



DIST.	ASA	FILM
1'	25	64 160
2'	16	22 32
3'	8	16 22
4'	5.6	8 11-16
5'	4	5.6 11
6'	2.5	4.5 8
7'		3.5 5.6
8'		2.5 4
		3.5

SPECIFICATIONS:

1. Physical Size:
Length, 6 inches; diameter, 3 1/4 inches; height, 10 1/4 inches (including detachable handle)
2. Weight in Air:
24 ounces
3. Weight in Water:
3 1/2 ounces
4. Energy Rating:
18 watt seconds
5. Power Source:
2 "C" size batteries
6. Number of Flashes:
300
7. Recycle Time:
Six seconds
8. Operating Depth:
160 feet maximum
9. Light Beam Angle:
60° diagonal
10. Hardware:
Nickel plated brass anodized aluminum
11. Housing:
Non corrosive "O" ring sealed, epoxy housing
12. Connector:
Permanent Bulkhead with Electro-oceanic (male)

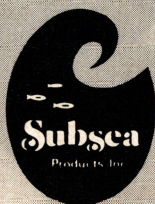
The Subsea Mark 25 Strobe is the most economical underwater light source ever built. LESS THAN 1/2¢ PER SHOT! (That's 25 times less expensive to operate than any type of flash system.)

The Mark 25 Underwater Strobe is powered by just two small "C"-size batteries, has an 18 watt/second power rating for extended battery life, more than 300 flashes per set of batteries, yet yields a light intensity output equal to a 100 WATT/SECOND STROBE!

Total adaptability! Our new little Mark 25 Strobe quickly and easily adapts to all Subsea arms and brackets making the Mark 25 another total system strobe from Subsea Products.

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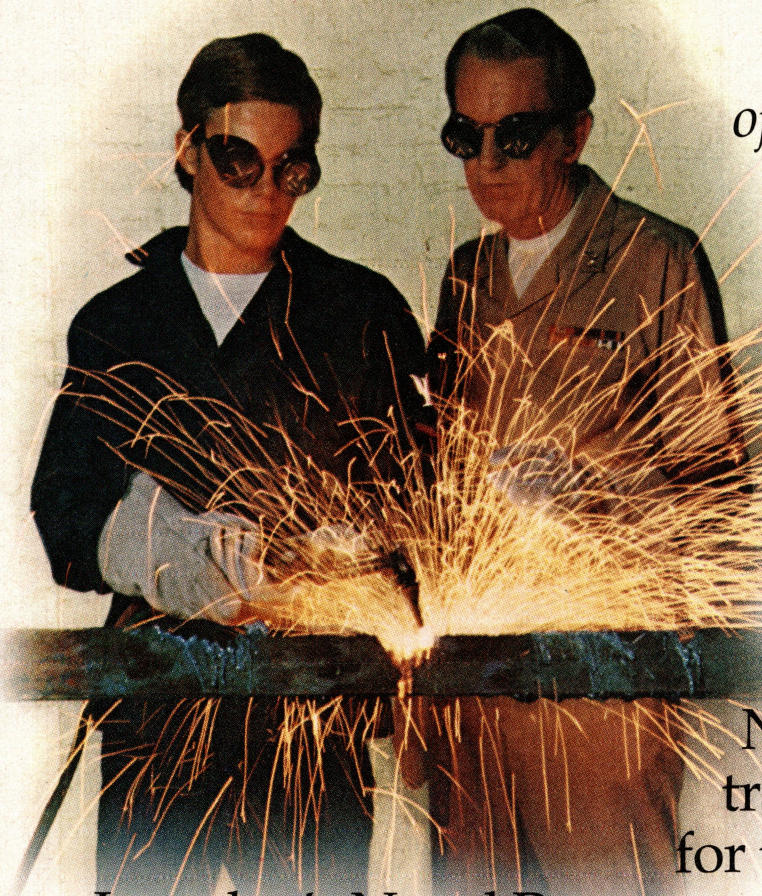
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knows about the
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you can get in the
Navy. But not every-
body knows that the
Naval Reserve offers the
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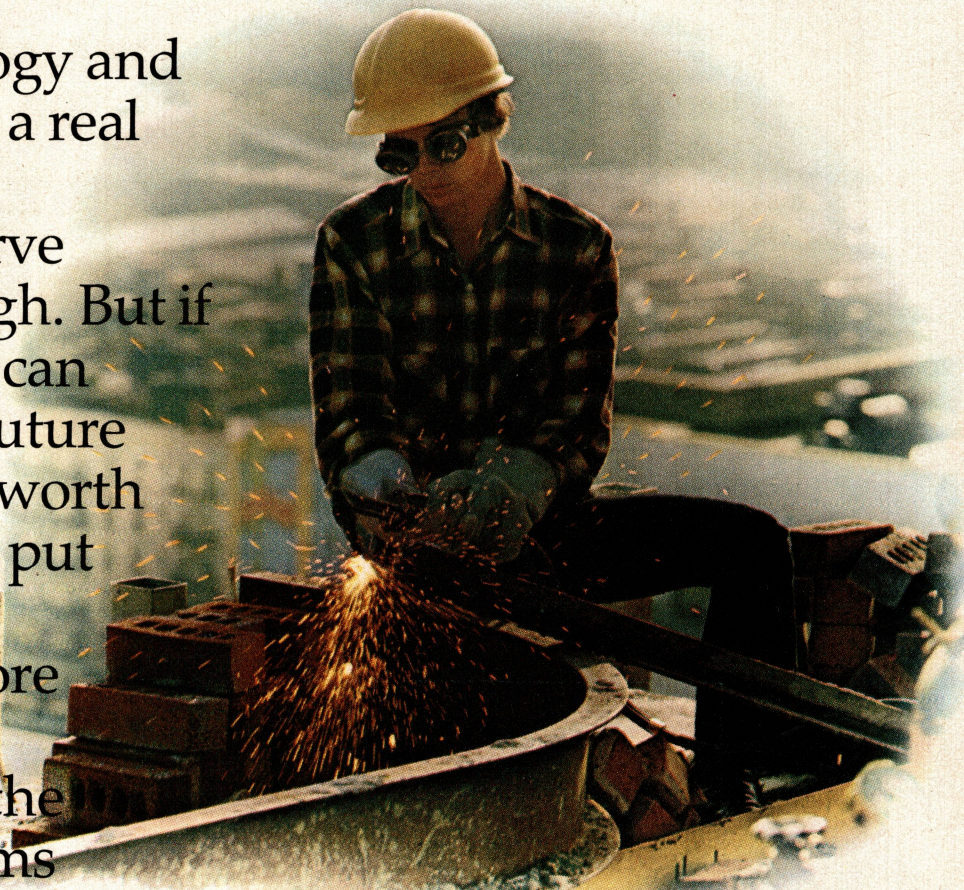
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- Combines time and depth measurements in a single instrument. You no longer need to carry along a separate depth gauge when you dive.
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- Swiss made and guaranteed for one year, the AQUADIVE TIME-DEPTH** has a suggested retail price of \$250.00. Ask to see the new AQUADIVE TIME-DEPTH at the dealer nearest you or write to AQUADIVE. Dealer inquiries invited.

AQUADIVE

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*U.S. Patent No. 3377860

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(Continued from Page 10)

written law that no one ever shoots fish with the help of scuba gear.

I wondered if this were some sort of technological degradation of man's reasoning and abilities, though it pained me greatly to see it in the sports that I love so much. It is like those tourist who come to Africa on their so-called safaris as great white hunters, and then proceed to decimate those beautiful beasts with high powered rifles at a half mile and dead rest without even placing a foot on the ground; and then call it sport. I have seen it, and I have mourned it.

Skin diving in its pure form is a fair and even competition between man and fish, and requires a great deal of skill, strategy, willpower, and physical prowess. Under these circumstances, the kill is fair and exhilarating. Any fool can kill fish with the help of scuba gear—all that he requires is time and money and more of the latter.

JOHN EDWARDS, M.D.

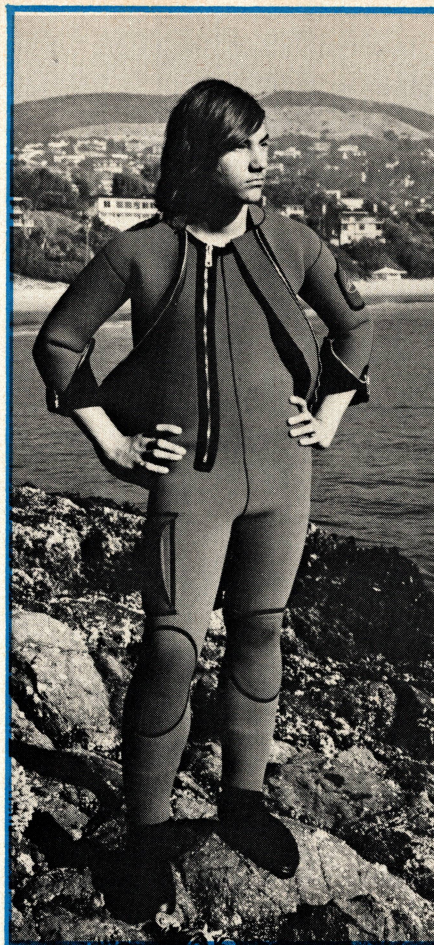
EVANS MEMORIAL HOSPITAL
CLAXTON, GA.

... Two apparently avid divers took a stand on instituting a physical for divers so as to avoid federal regulation due to the startling death of a diver who was obviously well informed of his own physical handicap. The solution to less regulation of our sport is not to regulate from within, as these two are proposing to do, but to let each person regulate himself. Begin by educating the diver and then let the diver make his own decisions. Our energies should be spent in explaining to the public that accidents like these are in no way a reflection of our inability to inform fellow divers of diving hazards, but instead are the result of the desires of the individuals themselves.

RUTH L. SARRETT WOODFORD, VT.

... Cardiovascular evaluation for scuba diving—The problem of myocardial infarction or heart attack while undertaking various forms of exercise is still under a great deal of study and evaluation throughout the world. The problem for scuba divers is ever increasing as a greater proportion of middle aged and older individuals are attracted to the sport while those who have been actively engaged in it for a number of years are moving into the category of risk. The basic problem from the instructor and diving physician stand-

(Continued on Page 30)



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THE CORONA DEL MAR—Nylon two deluxe full suit - black & blue - vest top pants with zipper entry - six self-locking nickel zippers - exclusive Del Mar design for maximum flexibility and comfort - all seams sewn and edges rolled - knee pads - thigh and shoulder pocket - twist locks - deluxe trim. Available in 3/16" & 1/4".

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The best-fitting fin yet! And a good fit means more COMFORT, more POWER. This is accomplished by using inserts that fit into the fin pocket. Soft inserts—true lefts and rights, and sizes from 8 to 13. The fin clamp shown is optional.



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underwater sonic alarm. And that they're a valve manufacturer with an in-plant forging facility.

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ALDA Who?

Sound like a new foreign import? A motorcycle? Is it short for Aldalene? Is it Frances Alda, New Zealand born soprano? What does ALDA mean to you, the sport diver? Plenty . . .

In every city in the U.S., dive retailers are associated together to promote and represent **safety** in sport diving. This organization is called the Aqua-Lung® Dealers Association, or ALDA. So ALDA is short for something, but it's long on ethics, commitment, and action.

In a frantic world, where profit often takes precedence over careful practices, ALDA represents a refreshing approach to the one industry whose very existence depends on safety, high standards and quality. All ALDA members have taken a pledge, made a promise to you, the guy whose life depends on all this. The Aqua-Lung® Dealers Association has even drafted an official Code of Ethics, which might sound corny, but we all know that what's between you and the ocean is between you and existence. ALDA is proud to take your life seriously.

CODE OF ETHICS

SAFETY The health and safety of purchasers are major concerns of ALDA retailers. This establishment requires a qualified certification card prior to selling, renting or re-filling of cylinders and regulators.

EQUIPMENT Quality brand merchandise is sold only in compliance with the law and the dictates of good judgement by dive retailers who earn and justify the confidence of the purchaser.

PRICING Competitive and honest prices are established for diving goods, based on quality and service with a fair return on the investment of time, work and money by the store.

REPAIRS Pleasant, skillful and expert servicing of merchandise shall be rendered to all customers. This is guaranteed by the ALDA emblem of membership, symbolic of quality and service. Repairs are made by a certified individual who has completed a U.S. Divers sanctioned repair course.

ATTITUDE Speedy and satisfactory service is expertly rendered to all customers. Product knowledge, technical advice and information on ownership and use of diving equipment are a free and cheerful extra measure of value given by ALDA retailers.

COMPETITION ALDA retailers will refrain from unfair competition and unjust criticism of competitors, their sales methods and products.

INSTRUCTION Instruction must ensure that each student receives benefit of the latest developments in procedures and processes. ALDA members will incorporate all such methods which help produce safe and competent divers. All phases of instruction must be taught by nationally certified instructors.



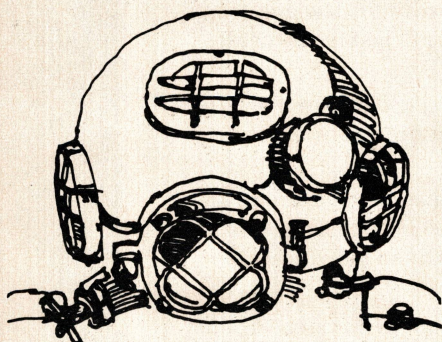
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ACTION NEEDED

There is a bill in committee of the U.S. House of Representatives that would impose a **TEN PERCENT TAX ON ALL SPORT DIVING EQUIPMENT** to provide funds for fish restoration and management projects in federal waters. This bill, H.R. 11016, proposed by House Representative Dingell, reads in part:

93d CONGRESS, 1st Session

H.R. 11016

IN THE HOUSE OF
REPRESENTATIVES

October 18, 1973

Mr. Dingell (for himself, Mr. Mailiard, Mr. McCloskey, Mr. Biaggi, and Mr. Kyros) introduced the following bill; which was referred to the Committee on Merchant Marine and Fisheries.

A BILL

To provide additional funds for certain projects relating to fish restoration, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

TITLE II — TAX ON SALE OF SPORT FISHING AND UNDER- WATER SWIMMING EQUIP- MENT

Sec. 201. (a) Section 4161 (a) of the Internal Revenue Code of 1954 (relating to the imposition of tax on the sale of certain articles) is amended to read as follows:

“(a) SPORT FISHING AND UNDERWATER SWIMMING EQUIPMENT —

“(1) There is hereby imposed upon the sale by the manufacturer, producer or importer —

“(B) of any article of underwater sport swimming equipment, including, but not limited to, wet suits, underwater face masks, snorkles, swim-

ming fins, air tanks, air tank regulators, and spear guns; a tax equivalent to 10 percent of the price for which so sold.

“(3) The tax imposed by this subsection is due and payable upon receipt of the payment from the vendee but not later than the close of the eighth month after the date of the sale.”

(b) The amendment made by subsection (a) of this section shall apply with respect to articles sold by the manufacturer, producer, or importer thereof on or after July 1, 1975.

SKIN DIVER feels that this Bill not only represents UNFAIR TAXATION, it is also discriminatory! Line fishermen will be directly affected because they all fish. However, all divers do not spearfish. The underwater spearfishermen represent a minority in our sport, with the majority engaged in general underwater recreation such as sight-seeing, exploration, wreck diving and/or underwater photography. The majority should not be taxed on the basis of the activities of the minority.

But to tax spearfishermen would be a form of DOUBLE TAXATION, as most spearfishermen are already taxed in the form of state licenses required to participate in their favorite sport. Furthermore, many spearfishermen are already supporting projects for fish restoration BY ACTIVELY WORKING WITH GOVERNMENT AGENCIES in the form of trash fish clean-ups, fish tagging projects, fish counts, etc. Why should these divers, who are actually working on problems rather than just talking about them, be taxed beyond the existing taxes that all citizens must pay?

Divers must get the addresses of their Congressmen from their local library, from their closest political party office, from the phone book — from wherever they can — and WRITE A LETTER OF PROTEST to this unfair Bill. SKIN DIVER URGES YOU TO DO IT NOW before we are all unjustly taxed by legislators who are not familiar with our diving community.

We've Turned To Temperature Technology

Farallon's Digital Thermometer is the latest advancement in temperature instrumentation. Encapsulated behind the digits are liquid crystals programmed to reflect light and color at the indicated temperature. The color of the digits changes from tan to green to blue, giving a reading to within 1 degree accuracy. Shock-proof and leak-proof, the Digital Thermometer attaches to any pressure gauge or combo made. A feat in heat . . . at \$8.95. See it at your local dive shop.

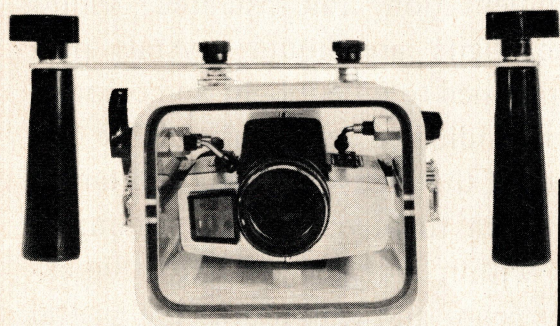
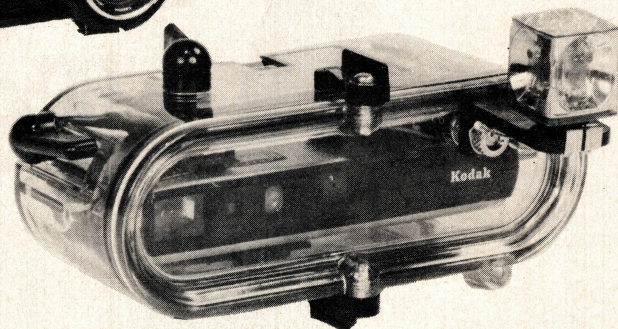
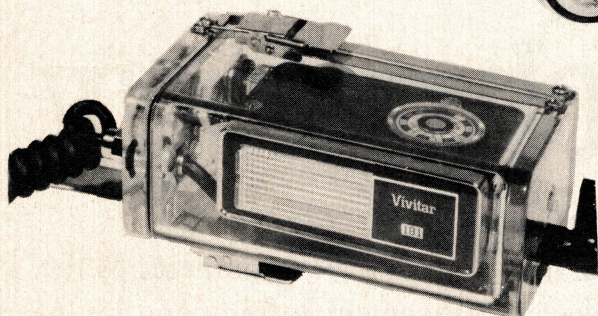
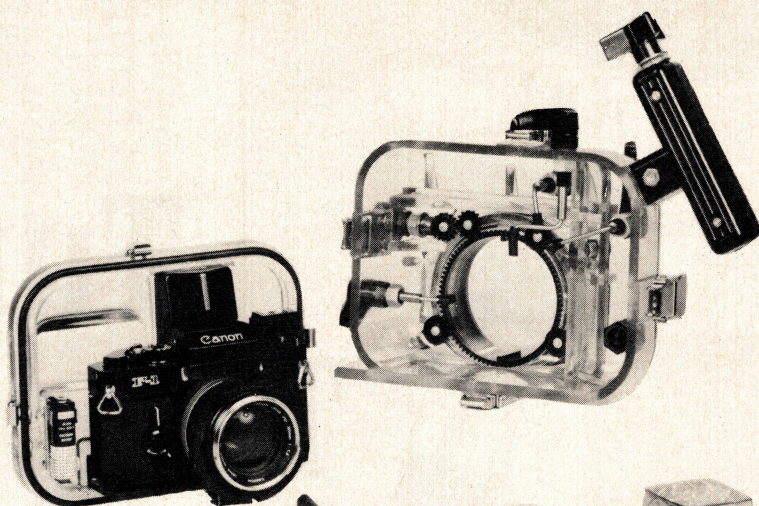


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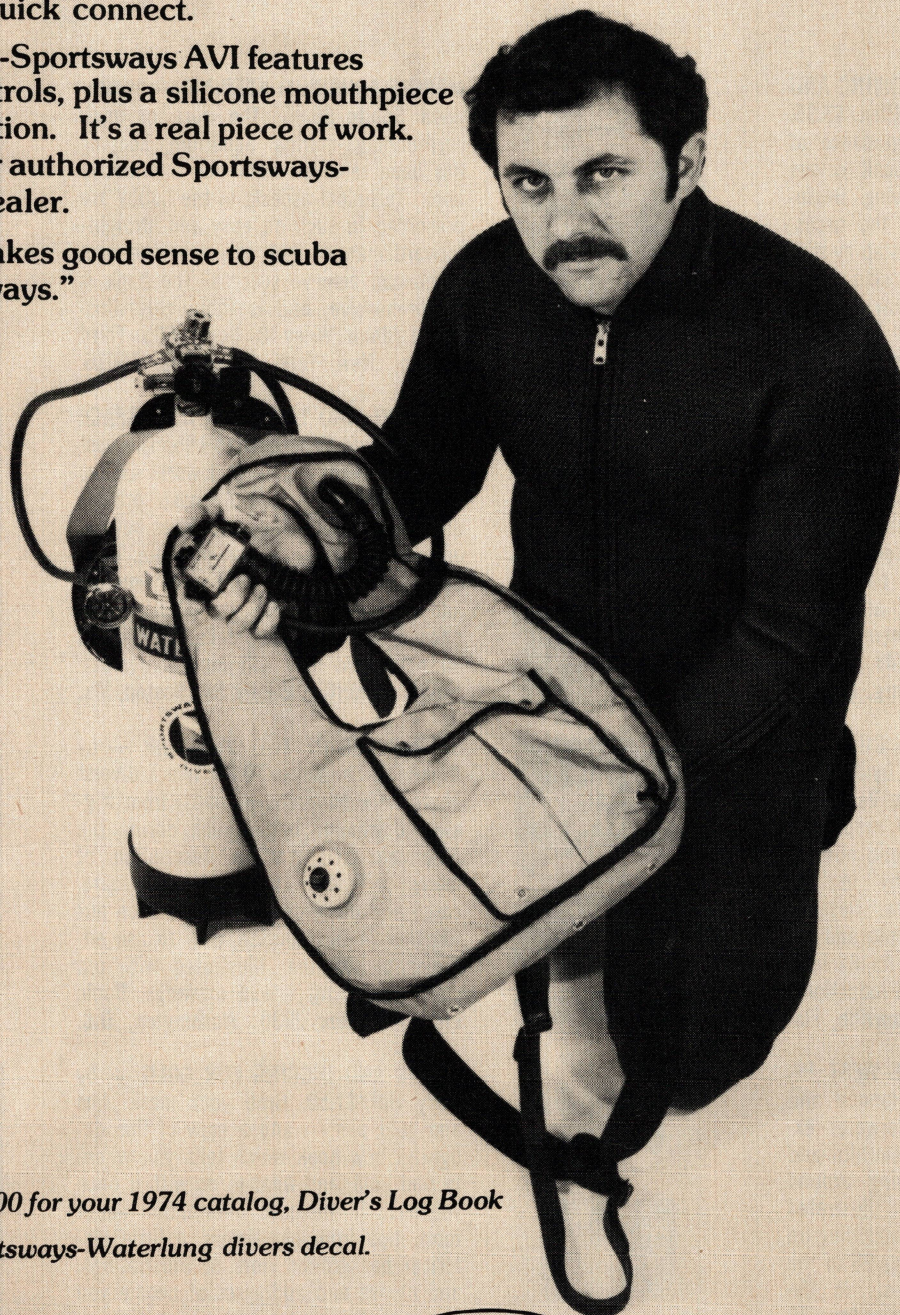
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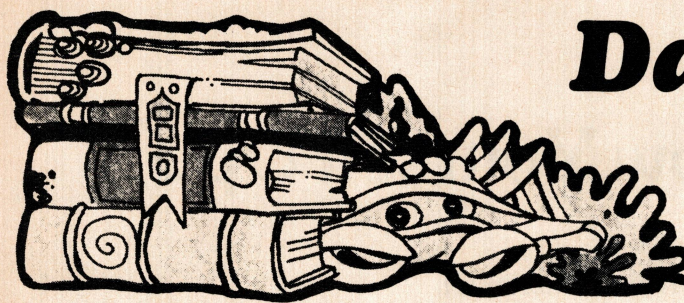
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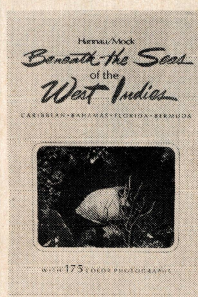
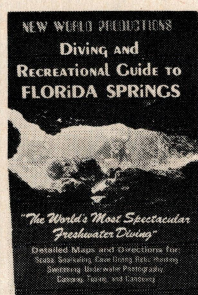
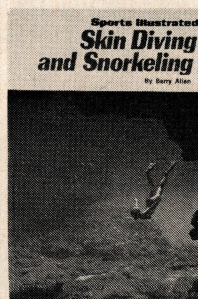
Davy Jones Review

SPORTS ILLUSTRATED SKIN DIVING AND SNORKELING — by Barry Allen/\$3.95. Written to supplement the guidance of a certified instructor, this book covers all aspects of basic sport diving. Beginning with an explanation of the necessary diving skills, it goes step-by-step through to the techniques of skin diving in open water. Easy to follow illustrations are used throughout. **J. B. Lippincott Co., 521 Fifth Ave., New York, N.Y.**

DICTIONARY OF SHARKS — by Patricia E. Pope/\$1.95. Over 125 species of sharks are illustrated in this work which gives identifying characteristics, size, color and range of each shark in layman's language. Additional sections detail such things as shark physiology, shark fishing, shark cooking, and shark attack (how to discourage them). **Great Outdoors Publishing Co., 4747 Twenty-Eighth St. North, St. Petersburg, Florida.**

DIVING AND RECREATIONAL GUIDE TO FLORIDA SPRINGS — Edited by Ned DeLoach, Tom Arteaga and Pete Velde/\$2. A handy book with detailed maps and directions for cave diving, relic hunting and underwater photography in the freshwater springs of Florida. Descriptions of accessibility, size, depth and average water conditions given for 62 individual springs. **New World Productions, 6043 Greenberry Lane, Jacksonville, Fla.**

BENEATH THE SEAS OF THE WEST INDIES — by Dr. Hans W. Hannau and Bernd H. Mock/\$5.95. Underwater explorers will delight in this beautiful and informative book about diving around the Caribbean. Thoroughly illustrated with 175 color photographs, including an identification portfolio showing 96 of the most common marine animals in the area. **Hastings House Publishers, Inc., 10 East 40th Street, New York, N.Y. 10016.**

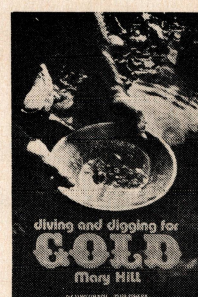
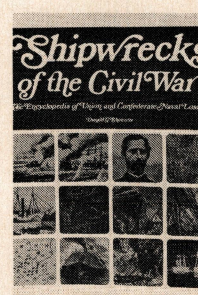
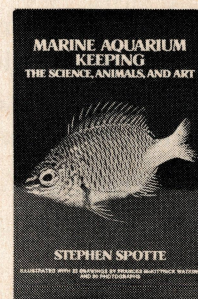


MARINE AQUARIUM KEEPING — by Stephen Spotte/\$9.95. The aura of myth surrounding marine aquarium keeping has been removed from this informative book. Technical aspects of the hobby are presented in such an easy and straightforward manner that now even the neophyte can achieve success. The book is comprehensive, and is thoroughly illustrated. **John Wiley & Sons, 605 Third Avenue, New York, New York 10016.**

THE MAN WHO LIVED IN INNER SPACE — by Arnold Federbush/\$5.95. The vast unknown of the underwater world excites the imagination of the most prosaic diver. This fascinating novel goes beyond our understanding of the possible, however, to an amazing situation of wonders and horrors. Following the call of the ancient Siren, the story takes readers on an adventure they will long remember. **Houghton Mifflin, 2 Park St., Boston, Ma.**

SHIPWRECKS OF THE CIVIL WAR — by Donald G. Shomette/\$9.95. Wreck divers! There were hundreds of ships, from frigates to whaling barks, sunk during the American Civil War. A description of many of these ships, including size, cargo and place of sinking, has been put together in this concise, easy to use encyclopedic volume. Illustrated with old photographs, maps and drawings. **Donic Ltd., P.O. Box 2930, Washington, D.C.**

DIVING AND DIGGING FOR GOLD — by Mary Hill/\$1.50. Grab your mask, fins and gold pan — and a copy of this delightful new book which tells you where to find gold, and what to do with it once you have it. Includes information about tools, tips from old timers, a little historical background, lots of illustrations, and names and addresses of people you can contact for more information. **Nature-graph Books, Healdsburg, Calif. 95448.**



THESE BOOKS ARE NOT AVAILABLE AT SKIN DIVER MAGAZINE

FAMOUS "SKINDIVER" CUSTOM WET SUITS

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$\frac{1}{4}$ " $\frac{3}{16}$ "

Sex Age

Height

Weight

☐ Ankle
☐ Calf
☐ Knee
☐ Thigh
☐ Hips
☐ Waist
☐ Chest
☐ Neck
☐ Wrist
☐ Forearm
☐ Elbow
☐ Biceps
☐ Ankle to Knee
☐ Ankle to Crotch
☐ Ankle to Waist
☐ Shoulder Seam to Crotch
☐ Wrist to Elbow
☐ Wrist to Armpit
☐ Center of back to Wrist

☐ Hat Size

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Kent, Washington 98031

Name

Address

City

State

Zip

EDITORIAL

(Continued from Page 4)

- completely on any automatic decompression device. Always use the U.S. NAVY TABLES as a backup.
- b) Be very sure you are following the prescribed ascent rate of 60 feet per minute. Use an anchor line or descent line to help gauge your speed. Practice your ascent speed by timing yourself over a preset distance. It should take a full minute to come up from 60 feet, or to swim one length of a standard 20 yard YMCA pool. You'll be surprised to find how slow you will have to travel.
- c) Spend a few minutes decompressing at 10 feet, whether you think you need it or not. It certainly cannot hurt you, but could help compensate for any errors or physiology problems of which you may not be aware. If you come anywhere near the bottom time limit (within four or five minutes) during a NO DECOMPRESSION dive in the 40 to 140 foot depth range, take a full five minutes decompression. If you're making a dive to 150 feet or deeper, take a full five minutes decompression regardless of how little time you spend down there. These guidelines are admittedly conservative, but it is far better to be super safe than sorry . . .

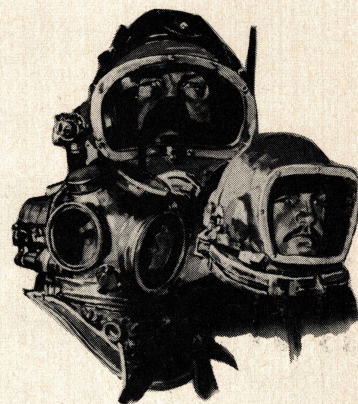
It is the opinion of this magazine that sport divers should contain their diving to well within the limits of the NO DECOMPRESSION TABLE, and they should use this table wisely and conservatively. Leave the super hairy decompression diving to the professionals; they get paid for taking risks.

Each year, tens of thousands of sport divers pour into the Caribbean and Pacific for diving vacations. The waters are invitingly warm, clear, and filled with fascinating marine life. The danger of bends seems remote when you're having a good time. But it must be remembered that only seven recompression chambers are known to exist in the Caribbean, and only eight chambers are to be found in the Pacific. Prevention of the bends becomes critical when treatment is virtually impossible.

Do yourself a favor — take five minutes at ten feet just to be sure. >>>

KEY LARGO MANAGER

Key Largo Diving Headquarters, in Key Largo, Florida, recently announced the addition of John Cahill as their business manager, and Chris Adair as their new associate underwater photographer and salesman. >>>



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By John Gaffney

They're off and running — and we don't mean the horses. \$25, \$50, \$100, \$1,000, and \$10,000 in real cash. Who said taking diving lessons doesn't pay off?

The first Scubapoker contest in the country was held at Corona del Mar State Beach in Southern California. Nine professional NASDS schools provided the contestants and the instructional back-up necessary to put the contest on. Over 200 divers and spectators lined the beach to watch the fluorescent-colored bottles move from buoy to buoy. At least that's what the bottles tied to the divers that completed the course did. It was a different kind of diving meet — no fish were killed, and for the first time in an under-

water contest, everyone on the beach could watch the action.

The purpose of a Scubapoker meet is to swim underwater to seven different buoys and remove one card from each station. Every buoy has a slate attached to it with the compass bearing to the next buoy. Nationally certified divers in buddy teams try to hit each buoy for a total of seven cards. As in poker, five of the cards count towards a poker hand. Anyone surfacing is automatically out, and anyone taking more than one card per buddy team from any one buoy is disqualified. To make it even harder, and to completely remove the element of chance, each diver must estimate his air consumption before the team enters the water. The Judge notes this on the entry



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form, and in case of a tie in poker hands, the team with the most accurate estimate of their combined air consumption wins.

If all this sounds too easy, believe me it isn't. The game demands teamwork, skill with a compass, total knowledge of your diving equipment, and a competitive nature.

Perhaps in the future, diving may have its own professional sport divers, traveling from area to area, competing in Scubapoker contests for money just like in professional golf, bowling, and tennis. We're giving the sport its start. You could be the guy or gal that wins this year's big money: \$5,000 for first place in the Scubapoker Nationals!

Even if you don't win the first prize in the Nationals,

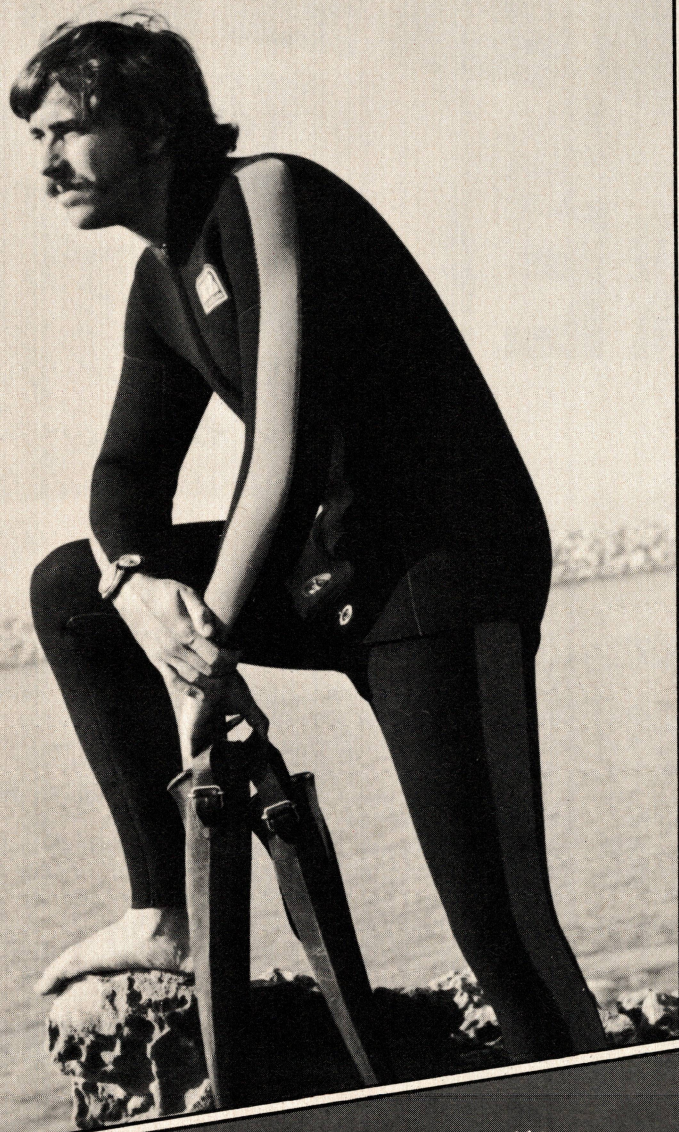
there's a distinct possibility you can win some money in your local Scubapoker contests. NASDS is giving away money! Besides the money, you are going to have a ball. Ask Don Smith and Dan Barron. They won the contest shown here and picked up a cool \$100.

The Good Guys from NASDS are letting almost everyone into their Scubapoker contest. All you have to do is register at a member NASDS school and show them a nationally recognized certification card. The cost? A five dollar bill. If you're a Club Aquarius member, it only costs four dollars.

If you want more information, write NASDS Scubapoker, 1757 Long Beach Blvd., Long Beach, California 90813.



Macho



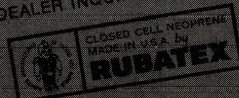
Introducing "MACHO"

We're excited about this new suit. Trouble is, it's hard to describe. It's great, but simple. We call it "Macho," because it brings together things you associate with a good man. It's strong and uncomplicated, has good looks without being flashy, and knows when to be tough, and when to let up. This is the suit we built for Skylab's recovery team. It had to be a no nonsense kind of suit.

If you're "Macho," this suit was designed for you.

By **SEA SUITS**
825 W. 18th St., Costa Mesa, Calif. 92627

DEALER INQUIRIES INVITED



(Continued from Page 17)

point is how to best evaluate and screen out candidates with potential cardiovascular problems. To date no single or group of studies has been completely accurate in screening out susceptible individuals.

Recently cardiac rehabilitation programs have been developed at a large number of population centers throughout the country. These centers utilize sophisticated exercise stress testing basically to evaluate the rehabilitation potential of heart attack victims. However, this same testing program can be utilized for evaluating individuals as to their potential for developing heart disease. Access to such centers is usually fairly easy and will become even more so as their number is increased throughout the country. Information about such centers can usually be obtained from the office of the local Heart Association.

I would stress that such testing is not infallible, however, it does represent probably the best output type of screening that we have today for picking up potential heart victims. My own policy has been to recommend to any male over the age of 35 contemplating scuba diving that such a screening procedure be performed.

ROBERT L. MECKELNBURG, M.D.

WILMINGTON, DEL.

... We are providing photographs for a book that will soon be published entitled "Dive Canada." Currently we are buying color and black and white photos that depict Canada from both underwater and topside viewpoints. (The majority of the photos will be underwater.) We need photographs that show typical Canadian animal and plant life, in and out of the water, divers in action, under ice scenes—in short, anything that says "Dive Canada."

THE SEA LIBRARY

8430 SANTA MONICA BLVD.,
LOS ANGELES, CALIF. 90069

... We have been subscribers for about 18 months, and have enjoyed every issue of SDM, but I think the December issue has to be a classic! Phillipe Cousteau's article was super, and I laughed so hard at the "Letter of a Non-Diver" that tears were running down my face. The other dive magazines I've seen cannot match your consistent combination of excellent photography and well-written articles.

I'd like to pass along a tip to readers like myself who have had a problem with the slippage of mask straps. I tried several kinds of tape, but they all refused to stick for long on the neoprene straps. A small cotter pin, squeezed lightly over the double layer of strap will do the job. The smooth rounded end that projects slightly will not catch on things, and if the plated type of pin is used they will not rust. Keep up the good work with SDM!
CHRISTOPHER H. MORTON
CHANUTE, KANSAS

... I was flabbergasted by the statement of Thomas P. Connors in your February issue that "Maine and New Hampshire are probably the only two places in the entire world where it is illegal to take lobsters while skin diving." In every Atlantic province in Canada it is illegal for skin divers to take lobster for any purpose; and it is in fact illegal to use any method other than the trap. Please make an effort to warn any readers who may have been misled by Mr. Connors' statement, since any Americans who come up here to dive and unknowingly take lobsters will face stiff penalties.

To be precise, the penalty for a diver taking lobster in Canadian waters is confiscation of equipment, and a fine, which is usually set at \$500.
STEPHEN ROSS

C.O. DEPT. OF BIOLOGY
MOUNT ALLISON UNIVERSITY,
SACKVILLE, N.B., CANADA

... You said in the article on Maine lobsters that Maine and New Hampshire were probably the only two states in the entire world that prohibit the taking of lobsters. This is untrue. Rhode Island also prohibits the taking of lobsters. These states are not only anti-diver, but they also add on stiff fines and you also lose all your gear.
EDWARD T. CORRAO

SOUTHERN MAINE
VOCATIONAL TECHNICAL INSTITUTE,
SOUTH PORTLAND, MAINE

... I am writing in reference to the article in News Briefs on page 46 of the November, 1973, issue of SKIN DIVER titled "Napping Sharks." I spent this past summer at Seacamp on Big Pine Key in the Florida Keys. I spent eight weeks studying the behavior of Lemon and Nurse sharks. One of the many things I observed was the fact that Lemon sharks do have the ability to breathe while lying motionless on the bottom. . . . Lemon sharks appeared to be much more active than the Nurse sharks.
PETER B. MAUTHE

COLUMBUS, IND.

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SEA LIBRARY

Publishers, advertising agencies, educational groups and a host of other organizations are taking advantage of a totally new service that promises to become the sea business of the year. It's Sea Library, Los Angeles, Calif., the world's biggest outlet for underwater photographers to have their work published. Sea Library offers background research, illustrations, graphics and production as part of their services.

Many well-known underwater photographers are under contract to Sea Library, including Dr. Joe MacInnis,



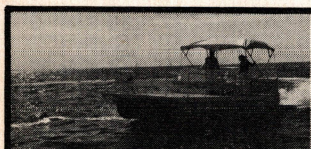
Jill Fairchild (left) and Cari Monska — a new sea service, the Sea Library.

Ron and Valerie Taylor, Al Giddings and Bob Evans. Sea Library, the brainchild of Jill Fairchild and Cari Monska, was originally started to collect photos for the Jacques Cousteau encyclopedia series and has expanded to provide a much-needed source of visual material on the sea. Contact: Sea Library, 8430 Santa Monica Blvd., Los Angeles, California 90069.

10th CEN-CAL INT'L U/W FILM FESTIVAL JUNE 22

A kaleidoscope of sound and color capturing the excitement of the underwater world will dominate Cen-Cal's tenth annual International Underwater Film Festival this June 22, at the Oakland Auditorium, Oakland, California. The dynamic Cen-Cal program is a San Francisco Bay Area classic, and has always been a showplace for new and innovative underwater photography. This 1974 presentation promises to be the finest show yet.

An exciting computerized slide show, entitled "Love Look at the Two of Us," will start off the program Saturday night. Created by Ernie Brooks of the Brooks Institute of Photography, this dynamic presentation combines the latest in technical know-how with the beauty of the sea. Another Brooks



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slide presentation, "In Search of Tomorrow," will also be shown.

The talented and popular Dr. Ted Walker will be on hand at the show to premier a film on his sensitive and touching experience on Lake Eve in Alaska, living in seclusion to study the life cycle of the salmon. Carl Roessler will dazzle the audience with a fantastic trip around the world — underwater; and William F. Bryan will touch viewers' hearts with a film about the friendly and playful sea otters. Bob Hollis, a co-producer of the Cen-Cal show, will present a new film which is a dynamic montage of stills and motion; and John Clark, the other co-producer of the show, will take the audience to the grave of the Italian luxury liner, *Andrea Doria*. A highlight of the show will be Bill McDonald's newest film on the life and splendor of the underwater world.

The masters of ceremonies for the festival will be two of San Francisco's favorite radio announcers: Carter B. Smith and Mike Cleary of KSFO. Judges for the international photo competition will be Don Greame Kelly, editor of *Oceans Magazine*, and Tom Beard, an instructor of photography at the University of California, Berkeley. The award winning prints will be on display in the lobby of the auditorium the night of the festival.

The Film Festival will begin at 8:00 p.m. Tickets cost \$3.50, and can be obtained from your local dive shop or by writing to: The Bamboo Reef, 3765 Redwood Highway, San Rafael, California 94903.

MIDWEST WRECK DIVES

Six prime weekends have been scheduled for wreck diving in Lake Superior's Munising Bay: July 13-14, 20-21, 27-28; and August 3-4, 10-11, and 17-18. Program directors are George and Betty Tomasi, and participants will receive the PADI Wreck Diver Certification if they perform satisfactorily and can produce logged proof of all other PADI Wreck Diver requirements.

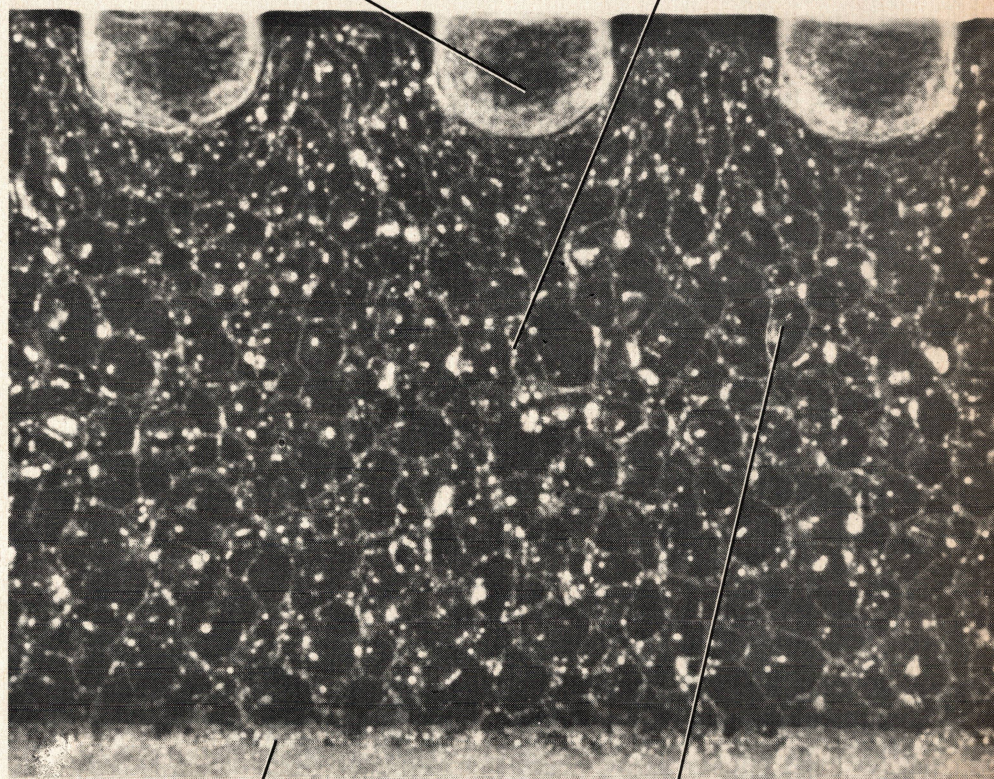
Munising Bay, 45 miles east of Marquette on Superior's south shore, is one of the "shipwreck graveyards" of the Great Lakes. Divers can expect to explore such classic wrecks as the *Dreadnaught*, a three masted schooner; the *Herman Hettler*, a wood steamer, and the *Smith Moore*, which sank in 1889. Jan and Dave Golisek will act as guides with their dive boat which carries up to 12 divers.

Tuition fee is \$39. A deposit of \$20 per person is required to reserve space. Contact: George and Betty Tomasi, NMU Scuba School, Marquette, Michigan 49855.

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UDT/SEAL



A FIERCE DESIRE TO SUCCEED

tough, proud, and dedicated, these NAVY frogmen are second to none

By Ellsworth Boyd

The hardest part was making up my mind I could do it. Teetering on the edge of the deep end of the pool, my hands bound behind me, my ankles lashed together, at that moment I was the most frightened man on the U.S. Naval Amphibious Base, Coronado, California.

I had come to write about BUD/S—Basic Underwater Demolition/SEAL (Sea, Air, Land) training, whose graduates are better known as “frogmen.” Before I embarked on my assignment the editor suggested that I “try to get involved.” I got involved all right, my first day at the pool, with five instructors and a group of trainees eyeballing my decision.

“Remember,” Chief Estok instructed, “keep your chin on your chest. Your body will sink eight to ten inches, then you’ll bob back up. As you feel the top of your head break the surface, exhale, lift your chin, take a short breath, then resume your original position. Bob and breathe for awhile, then use the dolphin kick I showed you to get back to poolside.” “And if it doesn’t work?” I questioned. “Then we’ll just have to send for another writer,” he replied, without a trace of a smile.

As the water closed over me, the ropes tightened and the eight to ten inch descent felt more like eight to ten feet! But sure enough, just like the Chief said, I bobbed right up. After bobbing and breathing a few moments, I used the dolphin kick and returned to the side of the pool. “Good!” the Chief lauded. “You’ve got the idea.”

The “idea” is called “drownproofing,” the frogmen’s method for water survival, originated by Fred Lanoue of Georgia Tech. So skilled are frogmen in this technique, they would starve to death before drowning. Being tied up evolved from the war in Vietnam. Sometimes POWs were transported at night in sampans. If the prisoner could quietly roll out of the boat, he would utilize drownproofing to reach shore and make good his escape. The enemy assumed that the POW had no chance to survive because his hands and feet were bound.

But drownproofing is just one of literally hundreds of training subjects, tactics and techniques that the volunteer “tadpoles” undergo in 23 grueling weeks at BUD/S. These are broken into three “phases” of five, nine and nine weeks, taught by 30 of the best instructors in the fleet.

During the initial five weeks the trainees live “on the run,” building up for two timed jaunts, one four miles, the other fourteen. The latter must be completed within two hours. They break out at 5 a.m. with a two mile run, followed by 30 minutes of “PT.” This daily physical training covers 20 exercises, with cringing nomenclatures like groin stretcher, trunk stretcher, side twistlers and wind mills.

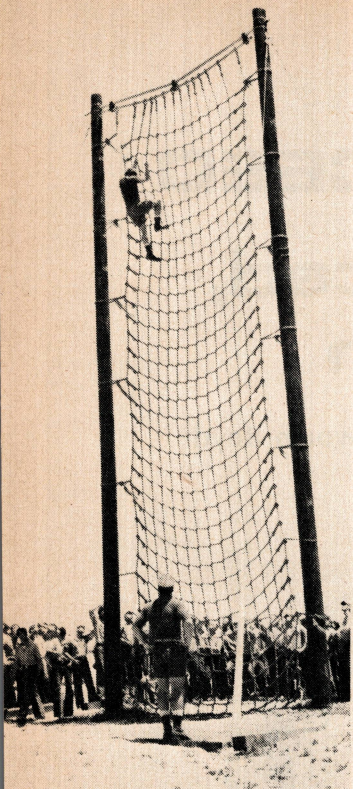
To supplement PT the trainees run the big “O” course. A series of 24 punishing obstacles that one trainee calls, “a fresh air torture chamber,” it pits man against time.



photographs by Dave Dennehy



During Hell Week, all UDT trainees have to cross the chemical filled “black lagoon” via two ropes stretched across the 20 by 30 yard pit. To get involved in this story, author Boyd jumped into pool with hands and feet bound for drownproofing test. Chief Estok supervised.

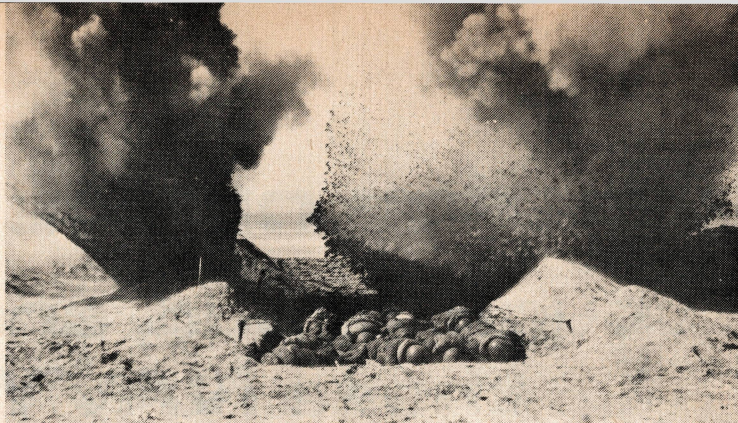


official U.S. Navy photograph

A 50 foot cargo net is one of 24 obstacles on the "O" course. During another Hell Week drill, the mud flats teach men to overcome the natural aversion to being wet and dirty. Charges of TNT blow skyward in a beach landing drill at the demo pits. A 300 pound watersoaked log is beached, pressed, squatted and curled during the "Log PT."



photograph by Tom Ryals



photograph by Dave Dennehy



photograph by Author

A volunteer must make it in 18 minutes or less by his third time through. As the program progresses he must do it in 15 minutes or less. At this point a good class will average nine to ten minutes per man. The record is six minutes flat!

Trainees scramble over a three story tower; climb up one side and down the other of a 50 foot cargo net; ascend a 40 foot scaffold called "slide for life," where they descend by a rope; do "low crawls" on their stomachs and backs, beneath fixed barbed wire; and go whole hog on 19 other obstacles with monikers like belly buster, belly robber, and dirty name.

Accenting the concept of staunch physical endurance, first phase incorporates long distance swims, hand-to-hand combat, drownproofing and log PT. The latter accommodates six to eight men hoisting a 300 pound log around as if it were a sapling. Just like weightlifting, the log is pressed, benched, curled and squatted. But unlike weightlifting, it's team effort that counts.

As the physical demands grow progressively arduous, volunteers get the picture that compared to BUD/S, all previous training was peaches and cream. If a guy can't hack it and wants out, there's a bell hanging in the muster area. All he has to do is ring it three times to instantly volunteer out.

IBS training and cast and recovery drills are included in first phase. IBS stands for "Inflatable Boat, Small," the rugged little seven man craft that trainees take over the sea AND the land. In cast and recovery the men are dropped, then retrieved by a speeding boat in an exercise that demands strength, coordination and perfect timing.

There is also combat medicine and weapons qualification, pistol and M-16, in this initial training period. But it's the fifth week that provides the climax of first phase in one of the most punishing ordeals a human can experience. It pits man against pain and the elements, in a week long trial of mind over body.

"It's a fierce desire to succeed," Commander Thomas N. Tarbox revealed, "and an inner force or motivation that drives our men on." A 17 year Navyman, whose entire ca-

reer has been in the UDT/SEAL Department or related jobs, the soft-spoken leader explained the frogman philosophy.

"It boils down to two things—the body and the mind. The body is capable of enduring physical hardships far beyond the realm of belief. The mind is the controlling factor. When the mind tells the body to slow down and quit, it usually does so. We teach our men to overcome this—to ignore this message from the mind and to push on. We teach them that the body CAN do it, that it MUST do it if they are to endure and survive.

"We teach them about the pain barrier. I read once about the long distance runner and how his pain barrier is something he must conquer in order to become a champion. That's exactly what we're talking about here. The pain barrier is in the man's mind, not his body. As he approaches what he thinks is the limit of his capability, he surmounts the pain barrier and becomes capable of doing virtually anything.

"Call it what you will: desire, motivation, stubbornness, guts—whatever it is, our men must have it in order to get through this training. We subscribe to an old Marine Corps motto: 'The more you sweat in peace, the less you bleed in war,' and believe me, we sweat at BUD/S."

I asked the commander about Hell Week and if it was really as tough as I had heard. "Hell Week is our big watershed," he disclosed. "Very few quit after this week. If a man makes it through Hell Week and keeps trying to the utmost of his capability, he most likely will graduate from this program. Most, however, quit before Hell Week.

"We had 29 men begin BUD/S training four weeks ago. Only 11 made it to Hell Week, which started last night. Today there are eight left. You're lucky—you'll get to see Hell Week." Maybe I was lucky, but I know eight men who could have used a basketful of horseshoes, four-leaf clovers and rabbits' feet to endure this man-made hell.

The "devil's disciples" are 12 tough Vietnam combat veterans, most with 10 to 20 years of naval service behind them. All are grads of BUD/S. Their "inferno" is the jagged rock jetty on the Coronado Beach; the unpre-

dictable surf and outlying depths of the Pacific; the swampy stench of the mud flats; and the deep, foot-slogging sand of the Coronado Strand. Stoking the flames of desperation and despair, the instructors goad, discipline and test the volunteers in a series of training techniques that make them wish the earth would swallow them up.

But the angel of mercy hovers and smiles down upon them Friday night. By Saturday morning she is plucking them from the fires of Hades. One thing for sure—in the beginning, nobody imagined that "Hell" could be so cold!

"Haul ass!" Chief Wayne Jones yelled. "This ain't no picnic!" A 20 year veteran, and combat hardened former boxer, he stood atop a jagged rock on the Coronado Beach, bellowing directions through a megaphone. The faint silhouette of a new moon did little to penetrate the chill, pitch blackness as I stumbled across the menacing rock jetty to where the surf was swirling around like soap-suds in a giant washing machine. I joined Chief Jones and Commander Tarbox.

"It's a good night for rock portage," the Chief mused. "High surf, no light and the water temperature matches the air—a brisk 50 degrees." What a paradox. Behind us, no more than a couple of hundred yards away, were the luxurious high rise hotels and condominiums of Coronado Beach. I could look back and see through the large, ocean-front picture windows, where people were watching TV, or entertaining friends in warm, comfortable rooms, oblivious to the drama that evolved on the beach below.

Two rubber boats, designed for crews of seven men, now trimmed to four each, stood offshore, awaiting the Chief's signal. Only the small waterproof flashlights, pinned to each man's kapok life jacket, were visible in the darkness. The Chief blinked his light three times and the first boat started its run. The coxswain had to follow the signal precisely to approach the jetty at its safest landing point. But even that "safe" point looked risky to me.

"Coxswain! Keep that boat straight or you're going to kill some people!" the Chief screamed. Somehow the boat had turned parallel to the jetty. A six foot breaker that had built up behind threatened to sweep the craft and its occupants into the rocks. But luckily for the coxswain, his crew straightened the boat and it took off like a surfer's dream, riding the curl and ensuing break. But unlike the surfer, there was no way to "bail out."

The bow struck a huge flat rock, the exact point the Chief designated for a landing, and lifted the boat and crew almost high and dry. Unfortunately the stern slipped backward, completely flooding the rear compartment.

"Get out! Get out and tilt the boat, you knuckleheads," he barked. "You act like you've never done this before!" The boat now weighed well over 300 pounds. The rocks were slippery, the visibility zero and the breakers kept crashing in. Struggling, the crew finally drained the craft, lifted it overhead and portaged it to the high, dry rocks.

The second boat crew fared a little better, but still caught a tongue-lashing from the Chief. "If you don't like these boat drills," he hollered, "then pack up and get out of here! Now let's have a couple of songs to show me how happy you are to be here!"

The two crews stood at attention, singing and shivering in the 50 degree night air. They wore fatigues, combat boots, helmets and kapoks. I had on a sweatshirt, a ski jacket and a heavy Navy foul-weather coat and still felt cold. I turned to the Commander and innocently asked, "Why don't they wear rubber jackets?" He looked at me like I was crazy. "They don't wear rubber jackets during Hell Week," he affirmed.

"If they're wet most of the time, how can they stand the cold?" I questioned. "Their bodies are callous and rugged," he reminded. "They've had five weeks of intense physical training to ready themselves for this. Remember what I told you about the mind being the controlling factor. Their bodies should never succumb to the cold. Their minds must direct their bodies to go on."

And go on they did. As we crossed the highway, on our way to the Bay, Chief Jones laughed out loud. "One night," he said, "when we were all standing here waiting to cross the road, a little old lady came stormin' out of that high rise over there, gave me holy hell and threatened to call the police! She had been watching from her window and said I had no right to put those 'poor young boys' through such misery!"

On the Bayside the men launched their boats for a one mile paddle to Point Golf, where they were instructed to come in "low silhouette, no noise, no paddles banging together." From there the crews are given a second rendezvous point three miles down the bay. On this one they paddle close to shore while the instructors ride down and wait for them. As we rode to rendezvous point one, Chief Jones and Chief Lowell Gosser told me about some of the tricks the "tadpoles" try to pull.

One boat crew had a buddy waiting for them in a van. They loaded their boat into the vehicle and drove to within a quarter of a mile of the second rendezvous point. Then they unloaded it, hid in a sandpit and waited for the other boats. When they heard them coming, they launched theirs and paddled in first. But undiscovered, an instructor had taken a walk up the beach and spotted them, yet didn't let on that he knew about their little scheme. When the boat arrived, all instructors were standing there with watches in hand.

"Too soon," they announced. "You paddled too fast. You arrived too soon. The enemy would have blown you to bits if you had reached this rendezvous point so quickly. Now turn around and paddle back to the starting point. Then paddle down here again, only not so fast this time!" To this day that boat crew isn't sure whether they were spotted or whether that "too soon" bit was really true!

"Talking about the cold," Chief Jones continued, "we had a trainee a couple of years ago from Brazil. He was used to the tropics and that warm weather, so he took two T-shirts and sewed a shorty wet suit between them. When I checked the men out each day to see if they were wearing wet suit jackets under their fatigues, there was no way of detecting it. He showed it to me at graduation, where I admitted that it was the most ingenious scheme I had ever seen!"

I left the trainees at midnight as they headed down the Bay to their rendezvous point at Turner Field. They spent most of the night there practicing night landings and beach reconnaissance, and got what Chief Jones calls "a good night's sleep"—one and a half hours! They would get a total of eight hours sleep during the entire week!

When I hit the Coronado Beach at 8 a.m. the next morning, instructor Louis Boisvert was briefing the men on surf passage. Boisvert, sort of a legend at BUD/S, is a stalwart advocate of physical training. When he speaks, they listen intently. When he orders them to move, they charge out like horses from a starting gate. This time they were racing through the surf, challenging the breakers.

Again and again they did it, first through the surf, back to the beach, then through the surf again. Two hours later, "break time" finally arrived in the form of "beach camouflage." Digging individual sandpits, then pulling

beach debris in on top of themselves—seaweed, dead fish, driftwood, tar—they lay there motionless, relishing the 15 minute rest.

"Up! Up! Up! To your boats—follow me!" It was the voice of instructor Bill Fletcher. Like the Pied Piper, they followed him down the beach, toting the rubber boats on their heads, singing an old favorite, "A Frogman Am I Sir!" When they reached the "O" course Fletcher ran them through a few obstacles, only this time they had to drag their boats over and under the barriers, too! Next he put them through two hours of log PT! I never realized there were so many different ways to lift, shoulder, tote, press and cradle a 300 pound, water-soaked log!

I asked Fletcher, a spunky, spirited leader, about the underlying philosophy of Hell Week. "It's an esprit de corps, a close knitness," he explained. "It brings the men together as a fighting unit. Take away Hell Week and our training program would lose everything. It WAS taken out you know, during part of the Vietnam War when we had to turn the trainees out fast. But then the sad results started coming in. There were more casualties, while some men weren't meeting the rigid demands of the war zones. All this just proved the value of Hell Week."

The trainees spent the afternoon at the swimming pool with instructors Estok and Frisk, who supervised drown-proofing, underwater knot tying without swim masks, relay races and lifesaving. That night they prepared for a five hour ocean paddle to Border Field, 12 miles south of Coronado Beach. Here they would set up a base camp, practice infiltrating, reconnaissance, and undergo the rigors of the dreaded mud flats.

The mud flats were unbelievable. A small river ran inland from the ocean, cutting the prairie in half. To the south were the foothills of Tijuana and the mountainous regions deep within Mexico's Baja California. To the north were a few isolated ranches perched on the bleak flatlands covered with tumbleweeds and ice grass. As the tide went out the river formed small tributaries of knee-deep mud. Oozy, bubbling and slimy, it was an environment suitable only for clams, frogs or tadpoles. Here the BUD/S "tadpoles" learn to overcome the natural aversion to being wet and dirty. It takes plain old-fashioned guts to persevere under these conditions.

I didn't know there were so many kinds of relay races until I witnessed the "mud flat olympics!" Back and forth from bank to bank they sloshed — forward, backward, crawling, tumbling, cartwheeling and leapfrogging. After two hours of relays, the winningest team was awarded five minutes rest! Wet and shivering they continued to sing through chattering teeth. Then a rubber boat was turned upside down, forming a perfect springboard for the main event — diving!

Points were awarded for the best dives. There were front-flips, back-flips, swans, twisters and the inevitable "sticker." Did you ever see a man dive head first into mud, head and shoulders completely engulfed, legs and feet sticking straight up in the air? I saw it and I still don't believe it!

"Hell Week proves to these men that they can perform unbelievable feats," explained Lt. Scotty Lyon, a 21 year career man who led a SEAL platoon on the first liberation of a POW camp in 1968. "Self-assurance and confidence are our bywords, with a never-give-up, stick-to-it spirit. There's camaraderie too, when they have to depend on each other in order to survive. Chances are they'll never face any obstacles in their lifetime as tough as those they're facing this week."

That night, working out of their base camp, the trainees mapped the coastline, then made plans for an assault upon the enemy. This reconnaissance took them from the beach, where they buried their boats, inland, across waist-deep and throat-deep streams, over the mud flats and back again.

At 3 a.m. they crawled into pup tents for a little rest, very little rest. Each man stood a rotating watch at one minute intervals. The first man stood watch for 60 seconds, then woke the next man. He stood watch for 60 seconds, then woke the next, etc. This continued for three hours until it was time to break camp and begin the five hour paddle back to Coronado.

"They get real 'dingie' at this point," explained Lt. Tom Richards, burly Navy heavyweight wrestling champ and prime Olympic prospect. "That's our term for dopey or punchy. They do things they'll never remember doing. When I went through I was so dinged I checked in at a non-existent gate. They say I even held a conversation with the gate guard!"

"Hallucinogenic phenomenon," is what Doc DeGrief calls it. "On long paddles, with the lights from the shoreline reflecting on the water, you see strange things, like locomotives steaming by! Swim buoys look like mines. One guy thought his paddle was a snake and threw it overboard."

On Thursday the trainees competed in marathon foot races around the Coronado Strand area, capped off by swimming competition in the base pool. By Friday I thought the toughest parts of Hell Week were over, but Navy photographer Dave Dennehy bantered, "You ain't seen nothin' yet!" Photographer Tom Ryals smiled. He knew where we were headed—to the dreaded "demo pits."

When the trainees reach the demo pits they have indeed entered a "living hell" of smoke, fire and explosives! Paddling in from the sea, the crews carefully watched Lt. Lyon, standing atop a dune giving specific landing directions. They had to follow his directions to the letter or get blown up! Lyon gave the signal to Lt. Commander Richard Brereton in the tower, then all hell broke loose!

Two charges of TNT, set in the surf, erupted one right after another on either side of the rubber boats, bellowing sprays 200 feet high. "Boats in! Hit it! Hit it!" the Lieutenant barked, as the men dragged their boats ashore and hit the beach face first. "Everybody face down!" he instructed. "Bunch up, head to heels, bunch up!" Another signal, then half pound charges blew sand and stones 50 feet skyward. The charges were going off three feet from them! Face down in the sand, they had to keep their mouths open to prevent their eardrums from bursting.

Lyon steered the group into a gap between two dunes, then ordered them to "hit it" again. Six more ear-splitting blasts echoed across the beach. That's when the lieutenant and the instructors in the towers started yelling, "So Solly!"

Crawling under 20 yards of barbed wire, the demo still going full blast, they inched along behind the dunes. I was 30 yards away and steadily back-pedaling. By watching the signals I knew exactly when the charges were going off, but they still scared me stiff! I'd jump a foot off the ground on the first explosion and six inches on each successive one. Lt. Lyon looked over, grinned and yelled, "Soooo Solleeeee!"

The blasting finally subsided and the men mustered 50 yards down the beach to negotiate permission to cross the "black lagoon pass." A four foot deep, 20 by 30 yard pit, the "lagoon" was filled with exploded chemicals, and covered by a thin, gray scum. The objective was to cross the vile pit via two ropes stretched from one side to the

other. One rope was for the hands, the other for the feet. The trainees didn't know it, but nobody ever makes it across the "black lagoon."

The hand-over-hand rope is attached to a pick-up truck, which Chief Estok artfully maneuvers both forward and backward. The top rope draws up as high as 20 feet above the water, then deposits the "tadpole"—in whip-lash fashion, right smack in the middle of the lagoon! Trainees go in head first, seat first, groin first, doing front flips, back flips, belly flops and other assorted entries.

Saturday morning finally arrived, as volunteers Miller, McCracken, Flannigan, Olson, Linse, Hatfield, Long and Addlesberger hustled one more time to the muster area. Here they were "secured." Hell Week was over.

They gathered around the drop-out bell, eyeing the 21 empty helmets beneath it. Tired but proud, only eight from the original group of 29 had made it. Before they left I asked, "What made you stick it out?" One said, "I didn't have nerve enough to ring that bell." Another said, "I saw the others doing it and I told myself, 'If they can do it so can I!'"

I asked what benefits, if any, they had derived from Hell Week. One trainee replied, "I know myself now,



photograph by Dave Dennehy

both physically and mentally. I feel dedicated to something and I think I can endure anything. Before this I didn't have much—I wasn't sure where life was taking me. Now I've got something that means a lot. I'm achieving and understanding life better. I've discovered a whole new world."

Most of them would sleep the whole weekend to be ready for second phase early Monday morning. Four major areas would be covered in these nine weeks: beach reconnaissance, including intelligence gathering raids and patrol action; planting demolitions—both land and sea; land warfare, stressing guerrilla tactics; and training with heavy weapons and grenades.

It's not until the third phase, the last nine weeks, that the frogmen undergo extensive diver training. In the beginning they work in the impressive new diver training tower. Forty-six feet deep, 20 feet in diameter, this 105,600 gallon fresh water tank houses a submarine escape trunk, a diving bell and a recompression chamber. Instructors use a Helle Hydrophone Communication System to instruct trainees as they work underwater.

Utilizing the tower, the pool and the ocean, trainees will take over 40 dives breathing mixed gas as well as com-

pressed air. One descent is a 150 foot bounce dive in the ocean using the Mark VI. On another plunge they free dive 30 feet without fins, tying knots to a trunk line on the bottom.

"They're thoroughly water oriented by the time they come to us," explained diving officer Tom Richards. "Most of them learn the diving easily, but soon discover there's more to it than meets the eye. Their diving work day is 7 a.m. to 5 p.m., plus one or two night dives per week. On other nights they have plenty to study. We teach diving anatomy and physiology. In addition, they have to be thoroughly familiar with air diving tables, partial pressures, formulas for mixed gas, and the complete physics of diving. They must successfully complete compass swims and underwater modes of attack. Nobody said it was easy."

The diving locker is the finest I've ever seen. Forty sets of bottles can be charged at one time! In addition to the training tower, there's a complete divers' supply and repair shop; classrooms with closed circuit TV; conference rooms; a sick bay; sauna and whirlpool baths; a universal gym and an armory. A 168 man barrack houses four men to a room, with adjoining study and recreational areas. The facility is three years old and Commander Tarbox said,



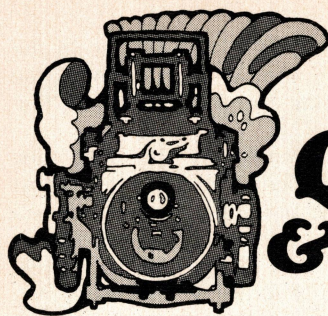
photograph by Bill Van Der Hoeft

"We went 'first-cabin' on this and we're quite proud of it."

The base at Little Creek, Virginia, no longer trains frogmen. UDT/SEAL teams are stationed there, but the Coronado facility is the citadel of basic training for everybody now. Upon graduation from BUD/S, the men take three weeks of airborne training at Ft. Benning, Georgia.

In the beginning, the volunteers come to BUD/S straight from basic training or from the fleet. But first they must pass a "screen test." This includes a 300 yard swim in seven and a half minutes or less, using a breast stroke and/or side stroke; a one mile run in seven and a half minutes or less; 30 push-ups within two minutes; 30 sit-ups within two minutes; 30 squat-thrusts within two minutes; and six pull-ups.

As I left BUD/S I couldn't help thinking of what Admiral Byrd said about his men, trying to describe their fortitude and determination in trekking through the Arctic wastelands. Proudly he proclaimed, "By God, they'll find a way or MAKE one!" That's exactly what the UDT/SEAL Teams do . . . in the surf, under the water, across the desert and over the beach. Through sea, air and land they've established themselves as tough, proud and confident Naval units, second to none. >#

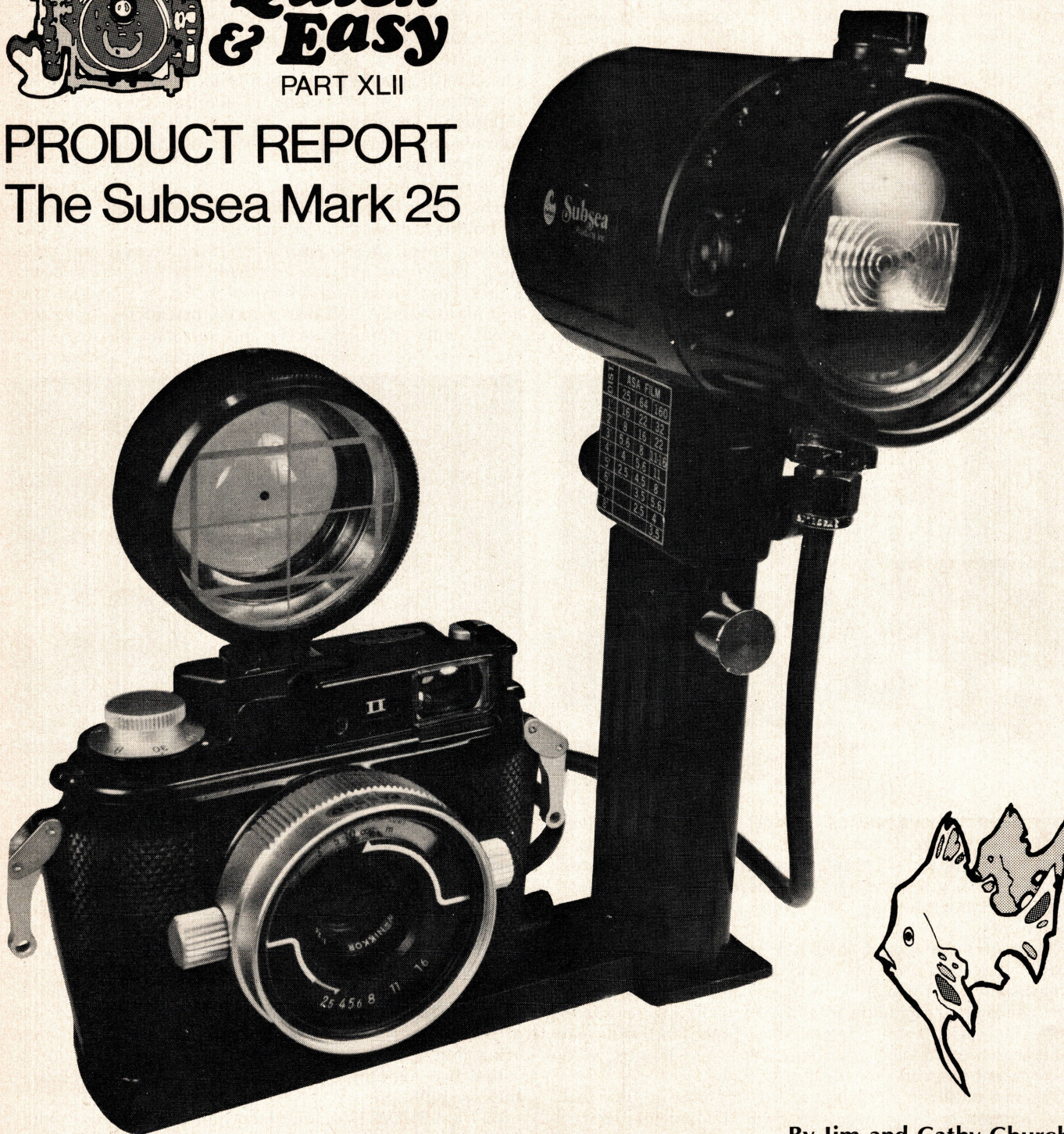


UNDERWATER
PHOTOGRAPHY

**Quick
& Easy**

PART XLII

PRODUCT REPORT The Subsea Mark 25



The Subsea Mark 25 must have been designed with the traveling underwater photographer in mind. Every feature of this newest, most compact member of the Subsea strobe family contributes to maximum utility with minimum size and weight. The strobe body is only six inches long, three and a quarter inches in diameter and ten and a quarter inches in height, which includes the detachable

handle. The unit's above water weight is only 24 ounces.

Evolving from the earlier AE 25, the new Mark 25 has a depth limit of 360 feet, gives up to 300 flashes from a single set of batteries and has a connector cord, with a male EO (Electro Oceanic) connector, permanently attached to the strobe body for a stronger connection. The epoxy strobe body is molded in two sections, front and

By Jim and Cathy Church

photograph by Authors

rear, and won't deteriorate in even the harshest marine environment. The front section contains the electronics and batteries; the rear section fits over the protruding battery compartment and seals against an O-ring seated in the front section. A finger-tightened, O-ring-sealed retaining screw passes through the rear section to hold both body sections together. Because the strobe body is O-ring sealed, it does not require a separate watertight housing.

The Mark 25 comes complete with a handle and camera bracket designed for use with a Nikonos camera. The molded, epoxy handle fits into a molded slot on the strobe body and is held in place with a finger-tightened screw. The handle then locks securely on a post attached to the camera bracket. When the quick-release button on the handle is pressed, the handle and strobe lift easily off the post for hand-held flash. The camera bracket fits underneath the Nikonos camera body and is held in place by a Nikonos EO connector adaptor which screws into the camera flash socket. The entire system is assembled and disassembled by hand—no tools are needed.

With the strobe secured to the camera, or held in the photographer's left hand, the off/on switch, ready light and a table of suggested f-stops for ASA ratings of 25, 64 and 160 are clearly visible. The camera bracket extends a few inches past the camera, on the photographer's right, and is already drilled for additional accessories such as a handle to use with a thumb-release trigger, or exposure meter, and has holes for bolting the bracket to a Rolleimarin or Hasselblad housing.

At this writing, the Mark 25 with cord, handle and Nikonos bracket, is priced as a package for about \$175. The Nikonos to EO connector adaptor is priced separately at about \$55. For U/W photographers who already have Subsea strobe systems, the Mark 25 can be purchased without handle and bracket and will attach to other Subsea flash arms. Camera brackets are available for attaching Subsea strobes to almost any camera housing manufactured.

Power is supplied by two size "C" flashlight batteries—a standard size available almost anywhere. A single pair of batteries can power 300 flashes with recycle times as fast as six seconds. For maximum battery life, alternate two sets, day-by-day, on extended diving trips. Batteries can be changed easily—unscrew the rear retaining screw by hand, lift off the rear body section and replace the batteries. To reassemble, reverse this simple procedure.

The U/W beam angle of the Mark 25—which measures 45 degrees vertically, 70 degrees horizontally and 60 degrees diagonally—completely illuminates the picture area

color temperatures ranging up to 6000 degrees Kelvin. Thus, the reddish filters some U/W photographers use to hold back bluish light may not be needed as often for close-up and medium-distance work.

In the f-stop department, the power of the 18 watt-second Mark 25 equals that of the larger strobes with 100 watt-second power settings. At a flash-to-subject distance of four feet, with ASA 64 film, Subsea Products suggests an aperture of f5.6 for the Mark 25, as well as the Mark 100 at full power and the Mark 150 at the 100 watt-second setting. The Mark 25's power, in terms of f-numbers, is largely due to the 60 degree beam angle (diagonal) which is significantly narrower than the 90 degree beam angles of the larger Subsea strobes. Because the light is directed into a smaller area, the relative intensity of light striking the subject is greater.

A Mark 25 and Nikonos camera form a system which is comfortable to handle and use. When entering or leaving the water, the entire system can be carried by grasping the strobe handle with the left hand. But caution: do not accidentally press the release button or the camera will detach and fall to the ground.

Underwater, with about three and a half ounces of negative buoyancy, the strobe can be aimed with ease. We find it especially handy for macro photography with a Nikonos and extension tube. Because the flash-to-subject distances will be only a few inches for macro exposures, the small size of the Mark 25 allows it to be maneuvered close to the subject for different lighting angles. This is sometimes difficult with larger strobes.

The Mark 25 can be switched from one camera to another during a dive. The EO connection on the strobe cord can be plugged into, or unplugged from, any female EO connector while underwater. The only requirement is that each Nikonos must have a Nikonos to EO connector adaptor screwed into place, and each housing (for housed cameras) must be fitted with a female EO connector.

Should a Mark 25 be accidentally flooded—possibly by a grain of sand under an O-ring—you may be able to repair the unit in the field. The procedure is simple: (1) Turn the strobe off. (2) Open the body, drain the seawater and remove the batteries. (3) Rinse—not soak—the interior components with warm water to dissolve and flush out the salt. The two screws holding the interior electronics in place can be removed, and the components in the front body section exposed for cleaning and drying, but work carefully. A final rinse with a solution of 50 percent water and 50 percent alcohol can be used to speed up evapora-

MARK 25 SPECIFICATIONS

PHYSICAL SIZE	—	3¼ x 6 x 10¼ inches
WEIGHT IN AIR	—	24 ounces
WEIGHT IN WATER	—	3½ ounces
ENERGY RATING	—	18 watt-seconds
POWER SOURCE	—	Two "C" alkaline batteries
NUMBER OF FLASHES	—	300
RECYCLE TIME	—	Six seconds
OPERATING DEPTH	—	360 feet
LIGHT BEAM ANGLE	—	60° diagonal
CONNECTOR	—	E.O. (Electro Oceanic)

of a Nikonos 28mm wide-angle lens. With 35mm cameras housed behind flat ports, the Mark 25 illuminates picture areas of lenses having focal lengths of 28mm or longer. With corrected dome port housings, it provides illumination for lenses of approximately 35mm or longer.

With a color temperature of approximately 5600 degrees Kelvin, the light emitted by the Mark 25 is less blue than the light from some other strobes which may have

SUGGESTED EXPOSURE GUIDE*

Distance to Subject	ASA Rating		
	25	64	160
1 foot	f16	f22	f32
2 "	f8	f16	f22
3 "	f5.6	f8	f11-16
4 "	f4	f5.6	f11
5 "	f2.5	f4.5	f8
6 "	—	f3.5	f5.6
7 "	—	f2.5	f4
8 "	—	—	f3.5

(Exposure guides furnished by Subsea Products.)

tion. (4) Gently shake the moisture from the unit and dry with warm air. A hair dryer is ideal. (5) After the unit is completely dry, replace the batteries and try a test flash. If the unit flashes, correct the cause of the flooding and get back into the water.

The Mark 25 and other Subsea strobes are distributed through authorized Subsea Dealers by Subsea Products, Inc., P.O. Box 9532, San Diego, Calif. 92109.

News Briefs

By Hillary Hauser Anderson



ACCIDENTAL FIND

There were wild goings on over the wreck of the *Association* some time ago, where divers were losing their salvage boats and attempting to sink others in a race to the historic, and supposedly rich wreck. (SDM, Dec. '69). The *Association*, which sank off the Scilly Isles in 1707, was the flagship of Admiral Sir Cloudesley Shovell.

Shortly after it was discovered in 1967, it was almost completely stripped and since then divers have concentrated their efforts elsewhere. However, a team of divers carrying out an eight-month survey on the *Association* for historical purposes came up with 7000 silver coins from the wreck that are worth over \$65,000. The coins, which were mainly English crowns, two-shilling pieces, shillings and sixpenny pieces, were discovered by the divers when they moved rocks to measure a cannon.

QUEEN MARY ROW

Up to \$14 million was illegally spent on the *Queen Mary*, according to a report by the Calif. State Lands Commission staff. The funds came from public tidelands oil funds for the Long Beach project and the report urged a lawsuit to recover the money. Long Beach officials say the report has "many inaccuracies, inconsistencies and contradictory statements." The City of Long Beach's conversion of the British ocean liner into a maritime museum - convention center utilizing tidelands oil funds has been in dispute for several years.

DIVERS AWARD

At the beginning of this year, U.S. Divers Corp. received an environmental award from the Los Angeles County Board of Supervisors for its abandonment of the speargun business. (The U.S. Divers' decision was made Oct. 1, 1973, at the suggestion of J. Y. Cousteau.) The award was one of five given to local organizations working on environmental projects.

R/V JOHNSON

The *R/V Johnson*, mother-ship to the *Johnson-Sea-Link* submersible, was launched at Linkport, Fla., in January. The ship has a decompression chamber and a laboratory for diving scientists. Cruising range of the 123

foot long, 210 ton ship is 3200 miles. Although there were originally various complaints about the design of the ship, anti-roll tanks, flopper stoppers, and a hydraulic bow thruster (for improved maneuverability) have been installed.

A & M WORK

Improved decompression tables for divers are being developed at Texas A&M's College of Marine Science and Maritime Resources (Galveston). According to Ocean Science News, tables are being developed through the use of computer models and recently developed theories of thermodynamics and kinetic decompression.

CAYMAN WEEK

The Cayman Islands Conservation Assn. is sponsoring a marine week, Aug. 25 to Sept. 1, 1974, to emphasize preservation of the Caymanian reefs. Special events slated for visitors and islanders will include U/W tours, both scuba and snorkeling, which will emphasize tropical marine ecology. Also planned are marine displays, slide/



film presentations each evening, and a repeat showing of the popular Second Annual Cayman Islands U/W Film Exposition.

PALEOPARADOXIA

The recently discovered skeleton of a giant 10 to 12 million year old sea mammal *paleoparadoxia* (ancient paradox) is on display at UC Berkeley. Its name comes from the fact that it has the body structure of a sea cow and the legs and teeth of a giant mastodon.

CEDAM MEET

The new CEDAM museum building for Underwater Recovery and Archaeology has been moved from Mexico City to Akumal. The building will be inaugurated during the Second CEDAM International Annual Meeting in Akumal, Quintana Roo, Mexico, June 22-July 1. During the 10 day meet there will be symposiums, diving and exploration.

NEW TREASURE TROVE LAW FOR MASS.

The governor of Massachusetts recently signed into law a treasure-trove bill sponsored by Sen. William Saltonstall and State Rep. Robert Cahill. Under the new law, a Board of U/W Archaeological Resources will be set up within the state's Dept. of Natural Resources. The six-member board will be responsible for overseeing all valuable finds made in and around the coast of Massachusetts out to the three mile limit.

The Cahill-Saltonstall bill allows the finder of treasure (or items of archaeological significance) to keep 75 percent of the find, and the state receives 25 percent. Only items over 100 years old, or worth more than \$5000, will come under jurisdiction of this new law. The Board will grant permits and the state will provide police protection when a find has been made. The Board must appraise and catalogue all items found within a six month period, at the end of which time, state and private museums within the Commonwealth will have the first option to buy them "at fair market value." The Board has the power to set regulations so that "the maximum amount of historical, scientific, archaeological and educational information may be recovered, reported and preserved." Says Saltonstall: "Our new law is a model . . . it protects the finder and gives him exclusive rights to recovery."

ON THE MATTER OF THE MONITOR

About once a year somebody finds the *Monitor*, the Civil War vessel which went into U.S. history books as the old "Cheesebox on a Raft." The *Monitor* was a Union ship which fought the Confederate *Merrimack* at Hampton Roads, Va., in 1862, in what was labeled as history's first engagement between ironclad vessels. On December 31, 1862, the *Monitor* was being towed by the *USS Rhode Island* to Charleston, S.C., to be used in the federal sea blockade of the south. Somewhere off the Cape Hatteras lighthouse, in a treacherous area called Diamond Shoals, the ships ran into a gale and the *Monitor* sank with all 16 officers and men aboard. The hunt has been on ever since.

The *Monitor* was unique. The nickname "Cheesebox" came from its revolutionary revolving turret, an innovation which spelled the end of wooden fighting ships. Also, the ironclad had an armor belt which encompassed the hull to protect it during ramming.

Diamond Shoals is a graveyard for about 3,000 ships. Sailing conditions for less-than-hardy ships is murder; and for diving, if you get one good day out of 30 in that area, you're "doing good."

In March, a Duke University team announced that it had found the *Monitor* 15 miles south of the Cape Hatteras lighthouse in 220 feet of water. The ship was found upside down, according to John G. Newton, marine superintendent for oceanography at the Duke Marine lab. During the expedition, which spanned five months and which was supported by the Natl. Geographic Society, Natl. Science Foundation, the No. Carolina Dept. of Cultural Resources, and the U.S. Army Reserve, U/W television cameras had been used to take photos of the ship on the ocean floor below. Scientists did not know that the wreck was upside down until they determined that the bottom had rusted out and that what had looked like an open hold was actually a deteriorated hull. For positive

identification, the expedition used the T.V. photographs as well as historic records and photographs and an 1861 handwritten description of the ship as specified by the ship's designer John Ericsson.

Plans were immediately made to investigate the wreck with the side scan sonar and U/W television systems of the *Alcoa Seaprobe* (this expedition was scheduled to begin April 1). However, at the time of the discovery, there were skeptics.

"Hell," said one noted marine archaeologist, "how can you take some blurry photos in murky water of some ship that's lying in an area of thousands of others and call it the *Monitor*?" While the Duke U. scientists maintained that diving was risky because of two knot currents in the area, our skeptic stated that many of these ships had round boilers and "the only way to know whether you have a boiler or a turret is by going down there and sticking your hand into a gun or cannon port."

Original press reports maintained that the Duke U. team had found that the turret had fallen off, and no mention was made of any sighting of it. However, Dr. Harold Edgerton of M.I.T. said that the turret was observed sticking halfway out on the right side of the ship. The Duke U. team also identified a piece of banding from an U/W photo which has been interpreted to be a portion of the innovative armor belting.

The first sighting of the *Monitor* came in 1954, when Bob Marx described finding an ironclad, which he believed to be the lost ship, in 50 feet of water one mile north of the Cape Hatteras lighthouse, one mile offshore. Since then, many "discoveries" have been made. Present indications from expert archaeologists are that the Duke U. find is the most likely discovery so far. The April expedition of the *Alcoa Seaprobe* may have already proven that the Duke U. ship is without a doubt the old "Cheesebox on a Raft." If not, we can expect the mad chase for the Union naval vessel to go on . . . and on.

SEA FOOD GALLEY

Here's a fund raising idea which one dive club put into action: the Santa Monica Blue Fins Diving Club recently printed their "Galley Cookbook" — a collection of seafood recipes including the exotic (sea urchins to sea cucumbers) and the usual (lobster and abalone). Club members did all artwork, typing and recipe gathering. If you are interested, write S.M. Blue Fins, 1332 6th St., Santa Monica, Calif. 91404.

POND PRODUCTION

A film is being made on the life cycle of plants and animals in the spring-fed pond located in the Red Bud Valley Natl. Conservation Area

east of Tulsa, Okla. The film is being shot in conjunction with the Life Sciences Dept. of the U. of Tulsa and U/W photographer Jerry Jones. Says Jones, "This film will show the general public as well as the diving audience that exciting diving and fantastic U/W photography needn't be associated with great depths and exotic places."

SUB SEARCH

The Japanese sub, *Igo-17*, which sank off Noumea on Aug. 17, 1943, was the subject of a search by a Tokyo television team visiting New Caledonia early this year. The sub sank about five km off the Amedee lighthouse near Noumea, and is believed to contain 96 bodies of crew-

men, some 200 meters under the sea. Six surviving crew members from the sub were rescued and imprisoned at the Ouen Toro mountain camp on Noumea; one of these survivors has given information on the sub's location to the T.V. team.

NEW FISHES

Last fall, Dr. John E. Randall (author of the book *Caribbean Reef Fishes*) spent five weeks in Mauritius collecting fishes. (Two weeks was with Margaret M. Smith, director of the J.L.B. Smith Institute of Ichthyology, Rhodes University, Grahamstown. Margaret Smith is the widow of J.L.B. Smith who was well known as discover-

er of the coelacanth fish *Latimeria*.) Smith and Randall collected or observed a total of 576 species of fish. Randall expects that about 15 of these are new to science.

HELP FOR KELP

Spores from transplanted kelp have produced the first natural kelp bed off Palos Verdes Peninsula (Ca.) since the plants were wiped out by thermal problems and pollution in 1967. Since 1971, the Calif. Dept. of Fish and Game and the Calif. Institute of Technology (Dr. Wheeler North) have transplanted more than 3000 fully grown kelp plants weighing an average of 30 pounds each from Catalina Island to Abalone Cove in the peninsula.

Freshwater Pictorial



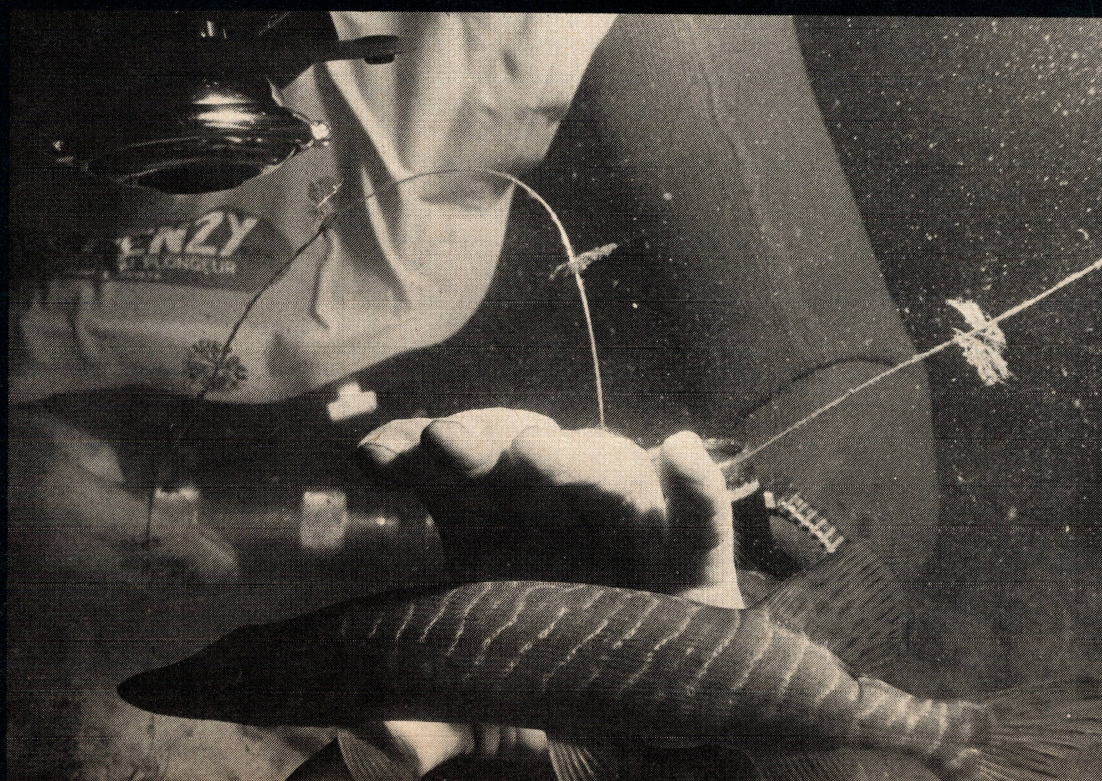
When, due to logistics, your choice of diving locations cannot include the bright, clear waters of the tropics, then you make do with what you have, be it the cold, bleak North Sea or the slightly warmer but quite turbid freshwater lake nearest to your home. This "make do with what you have" philosophy is avidly espoused by Henk Otto, who lives and dives in the Netherlands. It has served him well, and he has come up with some excellent pictures taken in fresh water where visibility ranges between two and six feet.

Otto believes that it is not the camera equipment used, but rather the man behind the camera that determines great underwater pictures. Otto uses a Pentax Spotmatic 35mm camera in a Russian made Zenith housing, and a strobe for artificial light. The Ilford FP-4 film is processed in Acufine at normal development. No special paper or printing techniques are used, although he sometimes does use a yellow filter to increase contrast while shooting. Both pike shots were made with a 35mm lens behind a flat port, and a 55mm lens was used for the eel shot. Distance from subject to camera was around 18 inches.

There is nothing tricky or drastically different about Henk Otto's style, other than he has a good eye and his timing and exposures are right on. However, look at what a difference lighting makes! In the photo of the pike poking his snout out from between the weeds he almost looks friendly, like a comical little dragon. In the picture where the diver is about to grab the pike, the feeling of the suspenseful moment is enhanced because of the side lighting. Starting from the "make do with what you have" philosophy, he has gone a long way. >000



Henk Otto



*SDM Captures first photos of
new decompression pastime*

blow an Air Ring

By Paul Tzimoulis

I could hardly believe my eyes the first time I saw one. Al Giddings and I were hanging off at 10 feet for 15 minutes after completing some documentary filming of the sunken Japanese submarine in Truk Lagoon. Each of us was deeply engrossed in his own thoughts as we hung there, waiting for the nitrogen to ooze from our bodies. As I slowly swung around, my attention was suddenly caught by the off position my dive partner had assumed. Giddings was leaning way back, with face pointed up.

At first I thought perhaps he was observing some small planktonic creature swimming past, but I could see nothing overhead. Perhaps he was admiring the cloud patterns above, for the water was very clear and the surface almost slick calm. With my curiosity aroused, I finned my way over for a closer look. It was then that I noticed Giddings beginning to pucker his lips in an odd sort of way . . . and that he had removed his regulator.

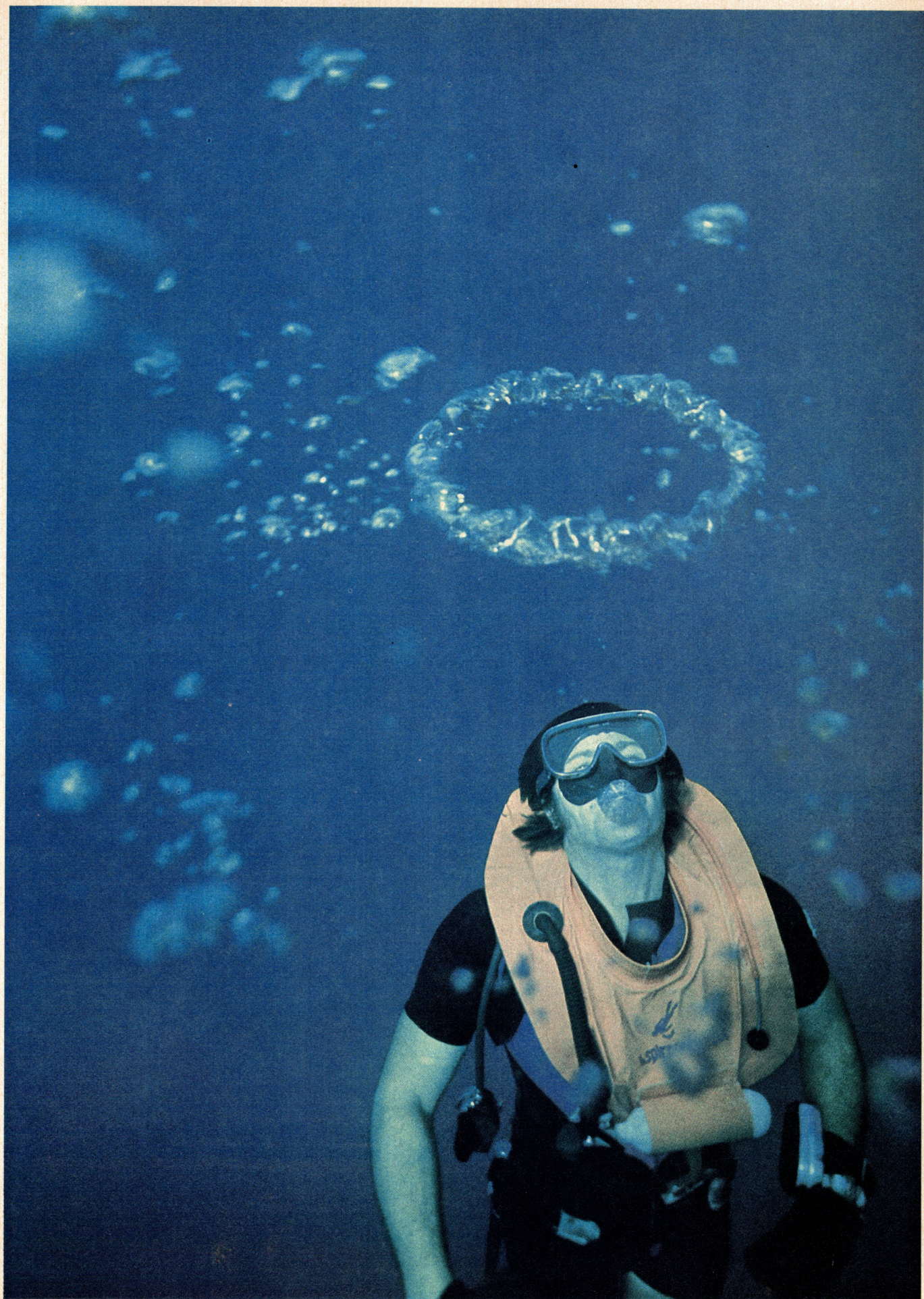
Suddenly he emitted a short blast of air from his mouth, and the bubble took the form of a miniature doughnut. I watched this bubble, now in the shape of a ring, slowly rise toward the surface — growing larger in diameter as it ascended. Its silvery sides sparkled from the reflecting light like a magical ring of quicksilver drawn upward by some mysterious force. As the diameter of the ring increased, its thickness decreased, for the air bubble was being distributed over a wider and wider area on its way to the surface. The sides were actually spinning outward-

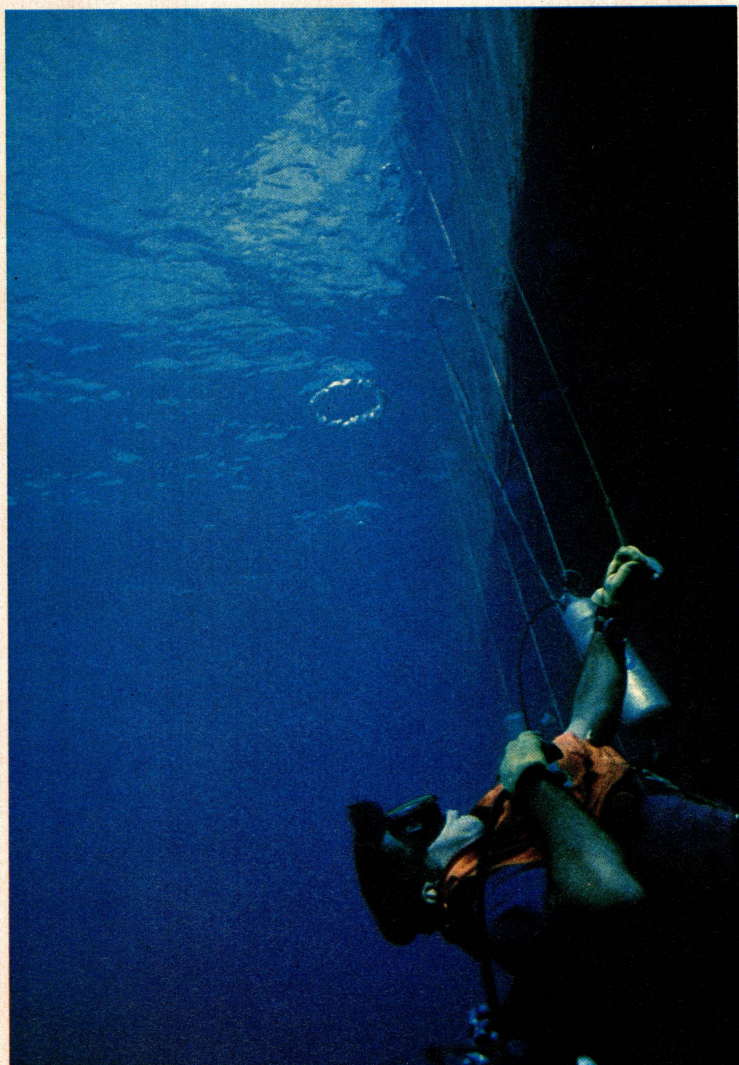
ly, adding a fascinating motion to the incredible object.

"Now how in the world did he do that?" I thought to myself. It was obvious this trick was no accident on Giddings' part. He had purposely blown an air ring just as effortlessly as a cigar smoker puffs smoke rings. By now this air ring had ascended 10 feet completely intact and surfaced as a ring of perfectly calm, smooth water. Giddings had already replaced his regulator mouthpiece and continued his decompression as though nothing had happened. Only the twinkle in his eyes revealed his inner delight over my puzzlement. A few minutes later he repeated the process, blowing another perfectly formed air ring — as though to verify it wasn't an accident.

During the remaining 10 minutes of decompression, I could do nothing but ponder what I had just witnessed. Was it some sort of trick, or had Giddings really perfected a way to blow air rings? I had never seen or heard of such a thing before. Did he have some sort of device hidden in his mouth? Could other divers perform this unusual feat? Ten minutes never passed so slowly, for I was dying to get back on board the diving barge and find out how Giddings performed his little miracle rings.

Later that day, after a good deal of teasing, Giddings related the story behind his development of this extraordinary technique. He first chanced upon the idea while working in the Gulf Stream off Fort Lauderdale in 1969. Giddings spent a couple of weeks filming Bob





photography by Author



One day while hanging on a decompression line in Truk Lagoon, Al Giddings held his breath, leaned back, puckered his lips and blew a bubble in the form of a miniature doughnut. The bubble grew larger as it ascended, its silvery sides sparkling from the reflecting light like a ring of quicksilver drawn upward by a mysterious force. The sides spun outwardly, adding a fascinating motion to this incredible phenomenon, the air ring.

Croft's practice dives and final world record breath-hold dive to 240 feet. Much of the film work was done at depths ranging from 150 to 250 feet, and there was a good deal of time spent on the decompression line for both Giddings and the safety divers involved. With little else to do but hang motionless in the water for long, boring periods, the divers amused themselves by attempting to blow different sized and shaped exhaust bubbles. A couple of the attempts resulted in bubbles which resembled rings of air, but these quickly dissipated, and no one really gave much thought to the idea.

Giddings pretty much forgot about "bubble-blowing" after the Croft film job, and didn't give it a thought for the next three years. It wasn't until late 1972 that he had another opportunity to experiment with the process. This time it was Rabaul Harbor, New Guinea — half way around the world from his first try. He and Dewey Bergman had come to this remote corner of the South Pacific to explore the World War II Japanese shipwrecks which lie on the bottom of this deep harbor. Again the diving was deep and decompression periods exceedingly long. This gave Giddings time to really concentrate on the problem, and in Rabaul he finally figured out the key factor involved — turbulence.

The swirling, moving water from previous exhaust bubbles was preventing the formation of a circular ring of air, and it would simply break apart. Giddings found he could solve this problem by simply holding his breath for 20 to 25 seconds prior to attempting an air ring. This was the turning point, and within days of practice Giddings was blowing air rings with regularity. His New Guinea diving companions, salvage divers Ian Short and Jim Forest, were absolutely amazed at this newly developed skill and soon they were also performing the feat themselves. By the time Bergman and Giddings were ready to depart, a new decompression fad was well on its way.

When Giddings reached Truk Lagoon in 1973, he had completely mastered the art of air ring blowing. He had improved his efficiency from one out of five attempts, to being able to blow an air ring every time.

Although the process appears deceptively simple, it requires a good deal of muscular coordination and timing. Any diver can master the skill, if he or she is willing to devote the time and effort necessary. Most novices find it frustrating at first because the technique is difficult to explain and requires the use of muscles which are not ordinarily utilized. If you want to give it a try, just follow Giddings' step-by-step explanation of how an air ring is made:

- 1) First you must position yourself at the right depth — 10 to 15 feet is optimum. Air rings formed at depths greater than 20 feet tend to break apart before reaching the surface.

- 2) Be sure you are securely positioned by firmly hold-

ing on to the decompression line or by wrapping a leg into the line. You must be very careful not to drift upward while attempting this feat since an air embolism is possible, even from this shallow depth.

- 3) The water around you and above you must be calm. Strong currents, heavy surge, or other turbulence will make it impossible to form air rings.

- 4) Be sure the inside of your face mask is completely empty of water, or it will end up running into your eyes and up your nose.

- 5) Lie back and look straight up toward the surface, while firmly gripping the decompression line. Double check to be sure you're not floating upward.

- 6) Hold your breath for approximately 20 seconds while remaining motionless. The turbulence created by your previous exhaust bubbles must completely dissipate. Do not move a fin or a hand, for even the slightest movements create water disturbance. Also, do not take an extra deep breath, for this will cause too much positive buoyancy. Just hold a normal breath (half a lung full or less), for you will only expel a small amount of air.

- 7) Remove the regulator mouthpiece slowly and gently from your mouth, being careful not to make too much of a disturbance. Form an "O" with your lips curled back slightly.

- 8) Hold the air back by blocking your mouth opening with your tongue . . . the same way that you do in preparation for clearing a water filled snorkel. Build up a little air pressure inside your mouth.

- 9) At the precise moment of release, snap your tongue backward, releasing a short, powerful blast of air. Then, snap your tongue back into the "off" position, thus quickly valving off the flow of air. The process is very much like clearing a snorkel, but the burst of air is smaller and of shorter duration. The air is sort of "hooted" out, not "spit" out or "blown" out.

- 10) As the air bubble is emitted from the mouth, it takes the shape of a small, fat doughnut approximately one and a half inches in diameter. By the time it reaches the surface, the ring will have expanded to five or six feet in diameter.

It takes a considerable amount of practice to acquire the right coordination for this technique, so don't be discouraged if you don't get it first try.

Now once you've become an accomplished air ring producer, you can tackle the fancy stuff. A single air ring is only the beginning. Giddings can now blow doubles . . . and even make the second, smaller air ring ascend right through the middle of the first!

Another impressive feat which Gids has mastered is to blow an air ring close to the decompression line and have it actually encircle the rope as it ascends. This maneuver is a little tricky and requires the aid of a slight current to slide the ring through the rope.

There's no end to the things you can do with air rings once you get the hang of it. 

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The Divator 324 Breathing System was never meant to be a secret.

It's just that most of our systems were going to commercial, military and scientific divers.

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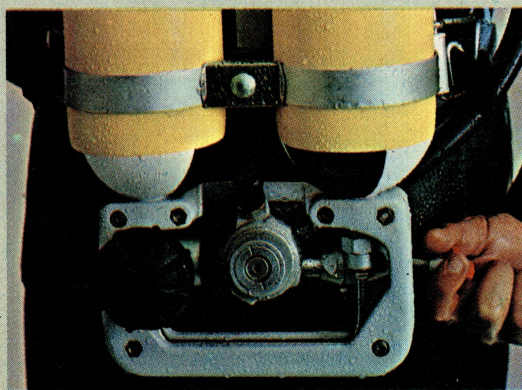
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The Divator 324 utilizes two small cylinders* (80.2 cu. ft. total capacity) instead of one big cylinder.

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In fact, we guarantee the Divator 324 will ride more comfortably, is more compact—and yet has 12% greater rated capacity than the bulky 71.2 cubic foot cylinder you have been accustomed to.

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It's easy to reach—yet there is virtually no way it can be actuated by mistake.

And the Divator 324 even alerts you in a special way when to go on reserve.

When your air supply is down to the safe minimum, the reserve air valve will slightly shorten each inhalation, *positively* alerting you to actuate the reserve supply and terminate the dive.

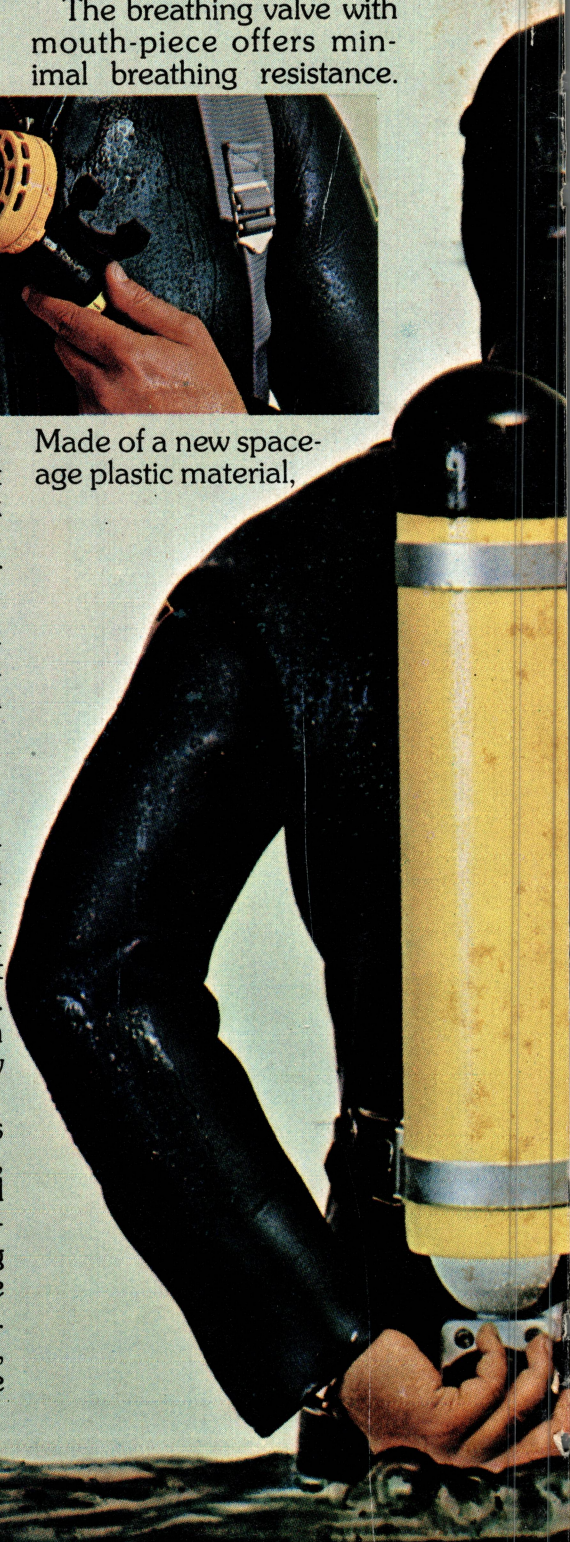
Unlike conventional systems, the Divator 324 does not increase

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Unique Regulator Unit

The breathing valve with mouth-piece offers minimal breathing resistance.

Made of a new space-age plastic material,



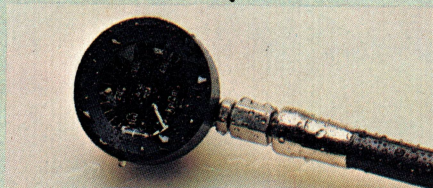
STEM NOBODY EVER TOLD YOU ABOUT.

it is impervious to saltwater, resistant to extremes of hot and cold, and so light it will not fatigue your mouth during a long dive.

The rubber-encased pressure gauge swivels for easy viewing, and displays in both PSI and atmospheres.

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The Divator 324 is also equipped with a quick-connect fitting to receive an "octopus rig," buoyancy compensator or buddy hose—plus an integral non-return valve for umbilical-supplied diving.

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The Divator 324 carrier assembly is "human engineered."

The rubber backpad is soft and flexible, and acts as a shock absorber for any movement of the cylinders. It will accommodate any size diver.

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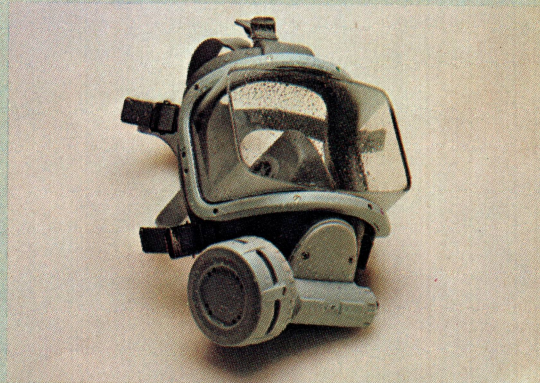
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It is also used extensively under arctic ice, and units have been provided to NASA, NOAA, and the Smithsonian Institution.

As we said before, the same Divator 324 Breathing System is now available to you.

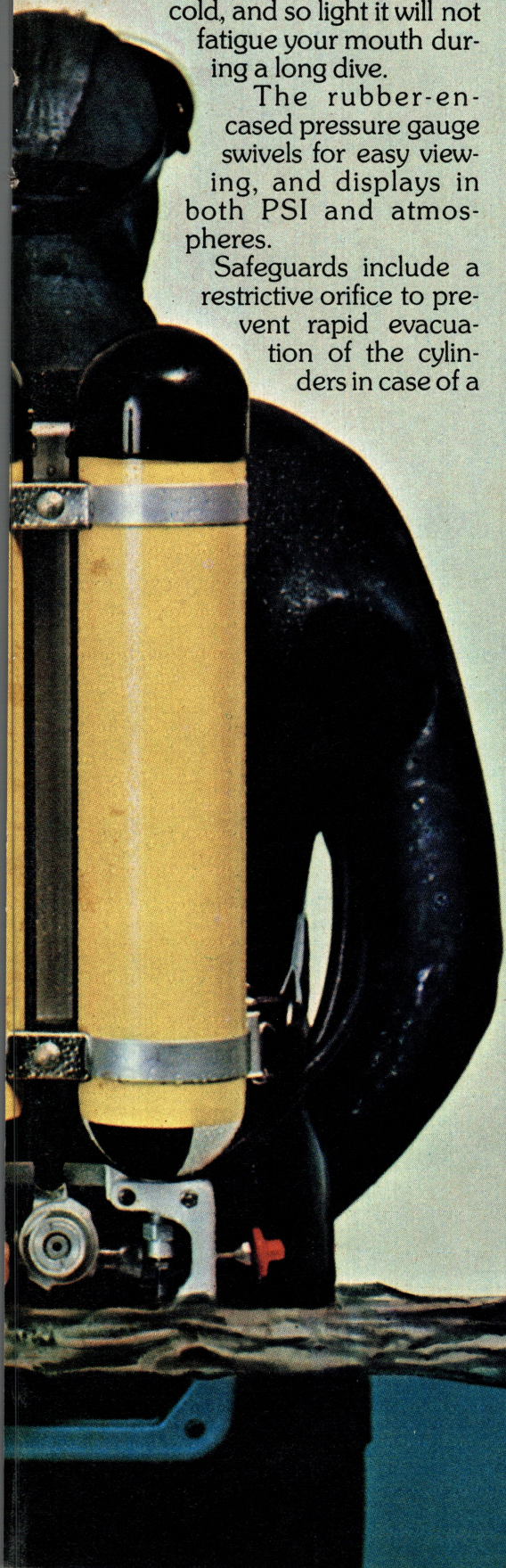


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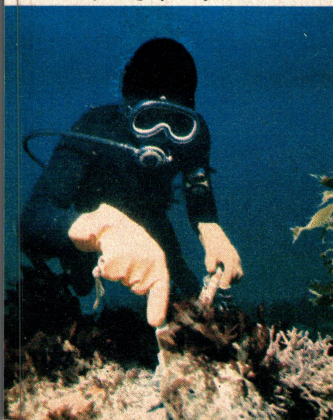
ABALONE

AN ENDANGERED SPECIES

By Bill Barada



photographs by Bob Evans

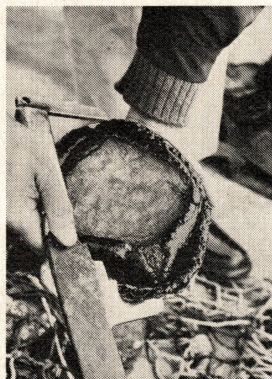


photograph by Paul W. Wild

When veteran skin divers sift through memories of the past, a few outstanding scenes and incidents always flash to mind more vividly than others. Such an event was my first sight of the spectacular underwater terrain off Carmel, California. It was in 1951, and a small group of us had driven up from Los Angeles to look for large red abalone, a species of delicious shellfish which thrived off the coast of central California. We selected a small, sheltered cove on the famous Seventeen Mile Drive and, as we dressed in long john underwear and dry suits on the sandy beach, a curious crowd gathered on the prestigious Pebble Beach Golf Course behind us.

ABALONE

The destruction of the abalone resource isn't a natural catastrophe, it is man-made. Abalone may become extinct because of pollution, the comeback of sea otters, fishing pressure, bar cutting by divers.



photographs by Bob Evans

Snorkeling out from shore, I watched the sandy floor give way to black volcanic rocks as the bottom slowly dropped away beneath me into deeper water. A jungle of iridescent kelp almost obscured the reefs, its fan-shaped leaves waving a kaleidoscope of color as far as I could see. It was a breathtakingly beautiful scene, but reserved only for the eyes of sea creatures. When I exposed the kelp to the air above the surface, the leaves lost their iridescence and were converted into dull, colorless blobs.

At a depth of about 20 feet great schisms and crevices ripped across the reef, permitting glimpses into mysterious caverns and grottoes that invited exploration. Taking a deep breath, I flipped downward and swam through a rocky window into one of the hidden chambers. When my eyes adjusted to the shadows, I found myself in a submarine grotto about the size of an average living room and it was so full of abalone it looked as if I had stumbled into one of Davy Jones' seafood lockers.

The walls, floor and ceiling of the grotto were literally plastered with the huge snail-like shellfish, many of which measured more than ten inches in diameter. Wherever I looked, abalone were climbing to the surface as thick as hotcakes on a griddle. They covered almost every square inch of exposed rock and in some places were so crowded for space the abs were riding piggyback on top of each other. The sight of so many shellfish concentrated in a single area was so fascinating that I ran out of breath and had to surface without picking even one.

That was abalone diving off Carmel as I saw it 20 years ago, and this was not an isolated or unique experience. Red abalone were just as thick in places on reefs all the way from Point Conception to Santa Cruz. In certain areas, we found hundreds of these shellfish were competing for space on almost every rock. Sometimes thousands were crowded into caverns and grottoes, and tens of thousands inhabited almost every cove and reef. The total population on this section of California coast must have numbered in the hundreds of millions.

It seems impossible that such a profusion of shellfish could be depleted. Yet, today abalone have virtually disappeared from mainland reefs and the populations around offshore islands are so thin that some scientists are concerned that the species may be threatened with extinction.



The demise of the abalone is a symptom of a greater tragedy which threatens destruction of marine resources along the entire Pacific Coast. The dimensions of this catastrophe are of such magnitude they offer a classic example of the mismanagement that plagues marine fisheries throughout the world. The seriousness can be appreciated from the results of a spot survey we conducted among divers, scientists, processing plants and state officials.

Central California — Red abalone beds have been completely wiped out for both sport and commercial divers all the way from Morro Bay to Santa Cruz. This was once one of the most productive areas of the coast. Landings at San Simeon, which averaged more than 500,000 pounds per year in 1957, dropped to zero in 1965 and the beds were abandoned. Landings at Morro Bay, which ran between 1,000,000 and 1,500,000 pounds a year between 1960 and 1967, dropped below 200,000 pounds a year in 1970, and officials predict these beds will also soon be wiped out. Red abs are still plentiful north of San Francisco where commercial diving is not permitted, but these beds may also be doomed for reasons explained later in this article. The same conditions hold true for the area south of Morro Bay where red abs can still be found on reefs from Shell Beach to Point Conception.

Channel Islands — Practically all of the commercial abalone landings now come from San Clemente Island (50



miles from the mainland) and Cortez Banks (100 miles from the mainland). However, populations are so thin in these areas that divers who once harvested an average of 30 to 40 dozen per day are now lucky to find 6 to 8 dozen a day. Abs can still be found on the lee side of Catalina and off Santa Barbara islands where commercial diving is prohibited. Abalone are still taken by commercial divers off Santa Rosa, San Nicholas, the northwest side of Santa Cruz, and a few around the Anacapa islands, but the concentrations are very thin and divers must work hard to make a day's wages.

Abalone processing plants, which once dotted the entire coastline, have been reduced to three or four large operators and these work only sporadically according to the fluctuating supply. Dick Pierce of Fisher-Pierce Company, the largest processor on the coast, says practically all of his abalone come from San Clemente Island and, if this area is closed, he will be out of business.

Southern California — All species of abalone have been virtually wiped out along most of the southern California mainland and only a few isolated spots such as Point Dume and Point Loma still produce legal limits of greens and pinks for divers who know how to look for them. Most areas are completely barren. Don Richardson, a commercial ab diver with 15 years experience, tells how bad the situation is off Laguna Beach: "My partner and I were

in the water an average of eight hours a day, three days a week, and found seven legal abs in five months."

Rimmon C. Fay, Ph.D., a diver-scientist and member of the state Coastal Zone Conservation Commission, estimates that the total legal size abalone population for the entire southern mainland coast is only about 100,000 to 200,000 specimens. It is truly alarming that the numbers of this once abundant species can now be easily estimated.

Equally significant is that the fingernail-sized baby abalone, which were once as thick as pebbles in shallow water, are not seen at all in many areas and are very thin everywhere. If adult populations are reduced below a certain critical point, successful recruitment cannot occur because most of the juveniles are lost to natural predators. Dr. Rimmon Fay says that abalone populations are in such a critical state that, in the absence of a total moratorium, there is absolutely no hope that the reds, greens, pinks and whites will survive.

The destruction of the abalone resource is not a natural catastrophe, it is man-made, and our investigation shows that the cause is poor management policies and practices by state officials who are responsible for the preservation of marine resources. These causes, in their order of importance, are:

1) *Pollution* — The effects of pollution are particularly obvious along the mainland coast of southern California,

ABALONE

but the same poisons are taking their toll in other areas as well. (SKIN DIVER, Sept. 1972). More than one billion gallons of combined industrial wastes and domestic sewage are dumped into southern California coastal waters every day of the year. The result is that this coastline, which was once one of the most productive in the world, is now a marine disaster area.

Dr. Lee Tepley, who filmed the *Poisoned Sea* off Palos Verdes, states that a blanket of sewage sludge covers the bottom over more than 50 square miles of the ocean and that virtually nothing except worms, urchins and similar detritus feeders can exist in these waters. Dr. Fay estimates that more than 100 tons of DDT are present in the bottom sediments. He also says that the concentration of toxic metals in this area is so great it probably would be economically feasible to mine them.

A similar situation exists off Orange County where cities such as Newport Beach and Santa Ana dump chemicals and sewage into the sea. Here, too, sewage sludge blankets the bottom, sick and diseased fish are prevalent, the eel grass beds and kelp forests are gone, and the reefs are ringed with abalone, lobsters and shellfish skeletons.

Studies by the Environmental Protection Agency and others show that persistent toxic compounds are particularly lethal to the spawn and reproductive processes of marine life. Many of these poisons inhibit reproduction of some species in concentrations as low as parts per trillion — which is less than an eye-dropperful in 1000 railroad tank cars. Dr. Fay says he sees no reason to doubt that the reproduction of abalone is being affected.

Yet, a one and a half million dollar, taxpayer-financed study by the California Coastal Water Research Project concluded, "The health and conditions of the southern California coastal waters and inhabitants are such that there is little cause for serious concern." We could find no studies by this agency, or any other public or private organization, on the effects of persistent pesticides and toxic metals on the reproduction of either abalone or kelp.

2) *Sea Otters* — Sea otters, once thought to be extinct, are now making a comeback and the return of these cute little animals may be a problem for Pacific Coast fisheries. They have a prodigious appetite, consuming around 25 percent of their own weight in seafood every day. They love abalone, but also eat such choice marine tidbits as crabs, clams, scallops, urchins, mussels, snails, squid, octopus, chitons, tubeworms, limpets, barnacles and starfish. A population of 100 sea otters will consume an estimated 500,000 pounds of abalone each year. At this rate, the present California population of about 1700 otters could eat an estimated 8,500,000 pounds of seafood . . . much of it consisting of abalone.

These animals spend more time eating than we do sleeping, and their devastating effect on abalone populations is well documented — in spite of claims by conservation organizations that such reports are exaggerated. California otter populations are concentrated in central California between Morro Bay and Santa Cruz, identical with the area where red abalone beds have been wiped out.

Not only legal adult-sized abalone are affected. The otters eat all sizes and the bottom has been picked clean. And, all areas are affected, including marine reserves such as Point Lobos and Hopkins Marine, where both sport and commercial abalone diving has been prohibited.

The total otter population is not large, but the animals are moving in a concentrated front, both north and south, away from areas where the food supply has been depleted. Advanced members of the northern front have reached Santa Cruz, but numbers have not yet penetrated in any numbers beyond Monterey Bay. Thus, red abalone can still be found in areas north of San Francisco. The southern front has reached Morro Bay and is probing into Pismo Beach, and the prospects for survival of the Pismo clam fishery look pretty bleak. Researchers watched a single



photograph by Richard Burge

Until a few years ago, dollar volume of commercial abalone catch exceeded that of lobster. Demand for abalone steaks is so great that until 1968 California law prohibited export.

otter consume 10 Pismo clams in one hour.

Authorities predict that the sea otters will eventually recolonize all of their original habitat, which extended from Baja California, Mexico, all the way to the Aleutians. Their first choice of food is abalone, but when these are decimated they eat almost anything they can catch, including fish. If the experience in central California is a preview of things to come, the otter fronts will continue to move along the coast, eating their way through such fisheries resources as lobsters, clams, crabs, scallops, etc.

Thus, Americans, and particularly Californians, are confronted with the dilemma of either permitting a carefully controlled harvest of sea otters, or reconciling themselves to the eventual destruction of marine fisheries which are a cheap source of food and protein for a hungry world. The Department of Fish and Game does not advocate harvesting otters. They contend that the commercial abalone fishery was founded on "overabundance" which resulted from the population explosion after the otters' demise.

Others, such as Dr. Rimmon Fay, dispute this hypothesis. Indian kitchen middens (garbage dumps) contain the skeletons of both sea otters and abalone, evidence that both species were present in sufficient quantities to serve as a food supply. This is verified by reports from early explorers which describe the methods used by Indians to

hunt both otters and abalone. Sea otters have few natural enemies other than man, and it is logical to assume that otter hunting by the Indians kept the populations of these animals under control.

3) *Fishing Pressure* — The depletion of abalone populations has been accompanied by a fantastic increase in price. A few years ago divers were paid \$3 per dozen. Today the price is \$18 to \$30 a dozen and will probably go higher. Thus, the uncontrolled law of supply and demand virtually guarantees that the beds will be harvested.

If higher prices are not enough inducement to keep divers busy on thinned-out beds, harvesting sea urchins will. Many divers are already supplementing their income by picking urchins for a new Japanese financed industry which processes the eggs into "caviar" for the oriental market. California urchins are called "gigantia" in Japan and the roe is in great demand. One processing company, World Business Corporation in Santa Barbara, said that, in season, they process 20,000 pounds of urchin eggs per day and during three months of 1973 they shipped 150 tons of caviar to the orient. It takes from 12 to 15 urchins to make one pound of eggs, so the prospects are that abalone divers will be kept busy by this new industry.

At first glance the harvest of sea urchins would seem to be a boon to abalone populations. Both graze on seaweeds and kelp, and reducing competition from urchins should benefit the abs. However, urchin roe is quickly contaminated by sewage effluent and similar poisons which make them unfit for human consumption. "Caviar-urchins" must be harvested from healthy ecosystems in which abalone also flourish. Thus, by picking both abalone and sea urchins, divers can work abalone beds that otherwise would be abandoned.

The destruction of mainland abalone beds caused fishing pressure to concentrate on offshore islands and the increasing price made ab diving attractive to both full-time and part-time divers. Many sport divers and boat owners purchased abalone permits as an excuse to take larger quantities and as a tax write-off. The marginal operators were discouraged when the Fish and Game added extra fees. It now costs \$25 for a license, \$50 for the boat and \$100 for an abalone permit, so only full-time professional divers or the wealthy can afford to play in this game.

However, Fish and Game also opened black abalone to commercial harvesting, reduced the legal size limit on red abs, and permitted commercial divers to work in less than 20 feet of water. Consequently, divers are now harvesting abs off San Clemente Island in water only five or ten feet deep. Scientists call the removal of the 20 foot depth limitation unwise, and even processing companies admit it was a serious mistake. Even these protected spawning grounds will now be eliminated.

4) *Bar Cutting* — Dick Burge of the Fish and Game Department stresses that cutting abalone with irons during removal is a major cause of the depletion of the species. He says experiments with abs in tanks show a 60 percent mortality from a half inch cut on the foot of an adult red. He estimates that the loss would be 80 percent to 90 percent in the field because of natural predators. The pink species, which is even more tender, would suffer virtually a 100 percent mortality.

Burge claims that, even if a cut ab is replaced and held in position until it re-attaches, the shellfish has little chance

for survival. The same thing is true, according to Burge, if abs are not carefully replaced in exactly the same spot and held until they obtain suction. Burge claims that predation of abalone is so intense by sheephead, bat rays and other fish that carelessly replaced abs have no chance.

The Department plans to publish a booklet illustrating the correct and incorrect methods of popping abs. Burge recommends a straight, wide bar (no bends or curves) with no sharp cutting edges. He advises that it be inserted at an angle to the shell and that pressure be applied by pulling against the shell so the bar does not cut the meat.

Dick Burge may be right and bar-cutting may be a major cause of abalone mortalities. But his instruction booklet and similar measures will be an exercise in futility unless better and more stringent management practices are initiated immediately. Burge says that such recommendations will be forthcoming when the ongoing research is completed. However, the final decisions are not made by Fish and Game biologists. The real decision-makers are Department officials and politicians in Sacramento who act, and react, to the demands of special interests.

Both Dick Burge and Dr. Fay state that sport and commercial abalone fisheries cannot exist in the same areas. Both also agree that access to abalone beds and similar marine resources must be limited. Dr. Fay advocates a "put-and-take" method of harvest which requires reseeding with baby abs to replace the harvest of adults. Abalone are now successfully raised artificially in central California, but growing them to adult size may not be economically feasible because the kelp required to feed them must be harvested in the open ocean and would be a terrifically expensive project. However, growing baby abs is very practical and reseeding would insure a continuous supply.

Dr. Fay advocates that commercial harvesting be controlled by allocating each individual diver, or company, a limited section of the ocean floor (similar to a mining claim). The diver would be responsible for managing and reseeding his area in order to grow enough marine life to make it profitable (as in farming). If he is conscientious, he stays in business. If he is careless or indifferent, he will go bankrupt and someone else will take over.

Sport divers' areas would also be reseeded, according to Dr. Fay. This could be financed by a special abalone license, or tag similar to the system now used for trout. These funds would be earmarked exclusively for financing the growing and planting of baby abalone.

He says we cannot continue to harvest marine resources on quantities based upon "sustained maximum yield." This encourages fishery industries to invest in facilities and personnel based on the highest possible catches and, when we have a bad year or two, they have an "invested interest" in maintaining high production at the expense of the resource. Permitted quantities must be based upon something less than "sustained maximum yield."

Dr. Fay says that a program of this nature may be initiated by the Coastal Zone Conservation Commission and would include the establishment of a Marine Resources Department completely independent of existing agencies.

However, Dr. Fay says flatly that the first order of priority for any marine resources program is the restoration of water quality. He makes it clear that, until pollution-damage is eliminated, all other projects are a waste of both money and effort.

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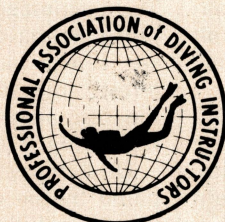
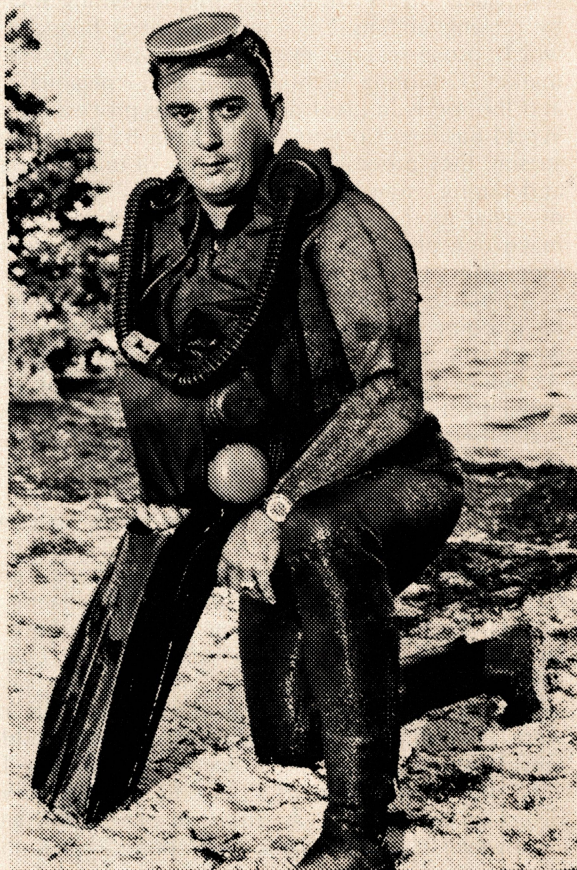
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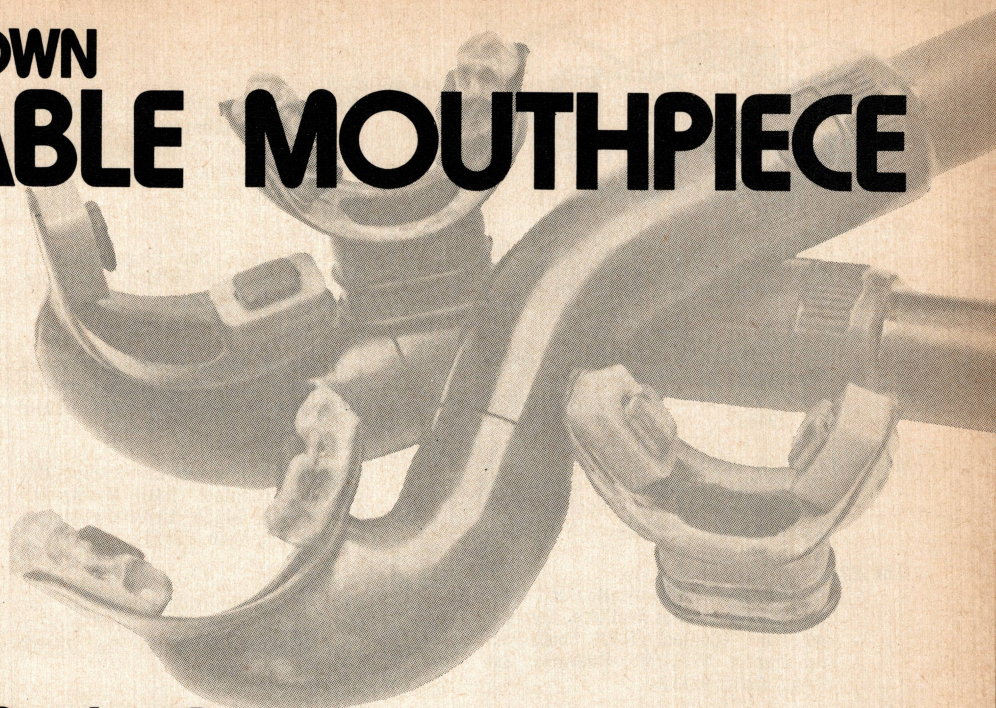
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BITE INTO YOUR OWN MOULDABLE MOUTHPIECE



photography by Author



An Exclusive SDM Product Report

By Jack McKenney

"How can you improve a snorkel?" is a question that has often been asked by the equipment manufacturing experts. You may not know it, but literally thousands of dollars have been invested in researching the ultimate snorkel tube, not to mention the thousands of man-hours that have gone into its contemplation.

Any pro snorkel worth its salt will have at least two important features — a large bore and a wrap-around design. The large bore allows for a greater exchange of air and the wrap-around design lays the snorkel close to the head, largely eliminating the possibility of entanglement in kelp, weeds, etc. It also minimizes drag considerably. So what's left — how can this simple "J" shaped tube be improved? Well, how about an individual mouthpiece for every person who uses one? The idea is so simple, it makes me wonder why no one thought of it before!

Ralph Shamlian, president of Farallon Industries, wonders the same thing, too. Shamlian was wandering around at the National Sporting Goods show a year ago when he came across a mouthpiece protector for football players that could be moulded to the shape of each individual's dentures. The idea struck him like a Mount Olympian thunderbolt. "Hark, Forsooth and Egad!" he declared. "That's it!" So with his little heels smoking he scampered to the nearest phone booth where he immediately called Ash Hollingsworth, his chief engineer, and told him of his brain wave.

Six months later the first Farallon Mouldable-Mouthpiece Snorkel, retailing at \$6.95, rolled off the assembly line. It's a large bore snorkel, and features a wrap-around design. In addition, there are two small, orange colored, thermoplastic inserts measuring one by two by three-fourths cm on the bite-pegs of the mouthpiece. When subjected to a continuous source of heat, such as boiling water, at about 125 degrees or greater for one minute, these inserts become soft. The mouthpiece is then put into one's mouth, and by biting down on the inserts, an exact impression of eight teeth on each insert (four on top and four on the bottom) will be left on what now looks like chewed Halloween candy. The next step is to immerse the mouthpiece into cold water to "fix" it. Presto! You now

have an individualized mouthpiece on your snorkel.

If you happen to have the dental structure of Dracula, but later on get a radical alteration from your favorite orthodontist, all you have to do is reheat the inserts and reform them. And in case you have the jaw strength of Godzilla, or your dog Igor happens to chew up your new mouldable inserts, you can buy a new set for only \$1. They won't fit on other snorkels because the bite-pegs on the Farallon snorkel have been designed to a special thickness for the custom inserts.

The mouthpiece swivels so that you can align it to any angle you like. If you want to fix it permanently in one position, mark the two sections with a pen, pull them apart, put some rubber cement on the joint, and put it together, lining up the pen marks. When the glue dries, the snorkel will be permanently angled to your specifications. There is also a strip of fluorescent tape around the top of the snorkel which glows in the dark — good for keeping track of your buddy while night diving. You can even use it for flagging down cars at night on the freeway when you run out of gas.

The appreciation of this new mouthpiece design is really experienced when using a regulator with one of Farallon's new Mouldable Mouthpieces. The regulator mouthpieces retail for just \$3.95. By distributing the load over four or five times the teeth area, jaw fatigue is reduced considerably. It isn't even necessary to bite down on the bite-pegs to keep the regulator in your mouth. All of the little grooves, valleys and ridges in the inserts have enough surface area to keep the regulator in your mouth with just a tiny amount of jaw pressure.

Using the new Farallon Mouldable-Mouthpiece is assurance against somebody scarfing your snorkel or regulator because it'll have your teeth-prints in it, and no two people's teeth-prints are exactly the same. So snorkel snatchers beware! Unless you have a cup of boiling water with you ready to re-form the incriminating evidence, you had better give it some second thoughts. The era of snatching snorkels is coming to an end. Stop into your favorite dive shop and tell 'em you want to customize your mouthpiece. They'll know what you mean . . .



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PADI Instructor Training Course, Miami, Fla. (Contact: Course Director, 971 SW First St., Miami, Fla. 33130)

June 14-16, 28-30
PADI Instructor Training Course, Charleston, S.C. (Contact: Course Director, P.O. Box 129, Sullivan's Island, S.C. 29482)

June 14-16, 28-30, July 5-7
YMCA Scuba Instructor Certification Institute, Trenton, N.J. (Contact: Peter Meyer, Box 611, Willingboro, N.J. 08046)

June 22-29
NAUI Instructor Qualification and Training Course, Scripps Institute, San Diego, Calif. (Contact: NAUI South-Pacific Branch, 4971 Mt. Muaymas, San Diego, Calif. 92117)

June 28-30
NAUI Cross-Over Program for Certified YMCA Instructors to become NAUI Instructors, Rockport, Mass. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Mass. 02117)

June 29-30, July 19-20, August 10-11
YMCA Scuba Instructor Certification Institute, Jonesboro, Ark. (Contact: Glenn Galtere, 28056 Harrisburg Rd., Jonesboro, Ark. 72401)

June 30-July 5
PADI Instructor Training Course, Marquette, Mich. (Contact: Course Director, Division of Continuing Education, Northern Michigan University, Marquette, Mich. 49855)

July 2-September 6
NASDS College, San Diego. (Contact: NASDS Educational Division, 1214 Rosecrans, San Diego, Calif. 92106)

July 8
Professional Diving Instructor Course, Monterey, Calif. (Contact: Ed Brawley, 598 Foam St., Monterey, Calif. 93940)

July 19-21
NAUI/YMCA Crossover Certification, Chicago, Ill. (Contact: NAUI Mid-America Branch, Box 14156, University Station, Minneapolis, Minn. 55414)

July 22-27
PADI Instructor Training Course, Fort Worth, Tex. (Contact: Course Director 2916 Wingate, Ft. Worth, Tex. 76107)

July 27-August 4
NAUI Instructor Qualification & Training Course, Petersborough, Ont., Canada. (Contact: NAUI Canada, 10 Monet Ave., Etobicoke, Ont., Canada)

August 3-10
NAUI Instructor Qualification and Training Course, Houston, Texas. (Contact: NAUI Southwest Branch, 2120 Peckham St., Houston, Texas 77019)

August 5-10
PADI Instructor Training Course, Marshall, Minn. (Contact: Course Director, Southwest Minnesota State College, Marshall, Minn. 56258)

August 10-18
NAUI Instructor Qualification and Training Course, College Park, Md. (Contact: NAUI Mid-Atlantic Branch, P.O. Drawer C, Deepwater, N.J. 08023)

August 12-17
PADI Instructor Training Course, New Brunswick, Canada. (Contact: Course Director, P.O. Box 721, Moncton, New Brunswick, Canada)

August 17-19, September 14-16, 28-30
YMCA Scuba Instructor Certification Institute, Chattanooga, Tenn. (Contact: Bart Jones, 2831 Birchwood Way, S.W. Marietta, Ga. 30060)

August 17-24
NAUI Instructor Qualification and Training Course, Chicago, Ill. (Contact: NAUI Mid-America Branch, Box 14156, University Station, Minneapolis, Minn.)

August 24-September 1
NAUI Instructor Qualification and Training Course, Vancouver, B.C., Canada. (Contact: NAUI Canada, 10 Monet St., Etobicoke, Ont., Canada)

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NAUI Instructor Qualification and Training Course, Veracruz, Mexico. (Contact: NAUI Southwest Branch, 2120 Peckham St., Houston, Texas 77019)

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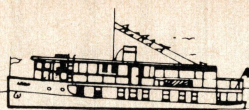
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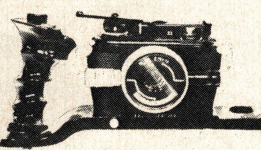
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YMCA Scuba Instructor Certification Institute, Passaic, N.J. (Contact: John Geary, 1007 Bellair Ave., Fairlawn, N.J.)

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NAUI Instructor Qualification and Training Course, Palm Beach Shores, Fla. (Contact: NAUI South Atlantic Branch, P.O. Box 10356, Riviera Beach, Fla.)

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September 21-22; October 12-13, November 2-3

YMCA Scuba Instructor Certification Institute, Dallas, Tex. (Contact: Pat Ryan, 4332 Northaven Rd., Dallas, Tex.)

September 27-28, October 18-19, November 22-23

YMCA Scuba Instructor Certification Institute, Indianapolis, Ind. (Contact: Tom Haver, 6001 Compton, Indianapolis, Ind. 46220)

September 28-29, October 19-20, November 23-24

YMCA Scuba Instructor Certification Institute, Indianapolis, Ind. (Contact: Tom Haver, 6001 Compton, Indianapolis, Ind. 46220)

September 30-October 5

PADI Instructor Training Course, Seattle, Wash. (Contact: Course Director, P.O. Box 70312, Seattle, Wash. 98107)

September 30-December 6

NASDS College, San Diego. (Contact: NASDS Educational Division, 1214 Rosecrans, San Diego, Calif. 92106)

October

YMCA Instructor Institute, Albany and northeast region. (Contact: Walter Hornberger, 7161 Spire Falls Rd., Gansevoort, N.Y. 12831)

October 7

Professional Diving Instructor Course, Monterey, Calif. (Contact: Ed Brawley, 598 Foam St., Monterey, Calif. 93940)

October 30

PADI Instructor Certification Course, Seattle, Wash. (Contact: John Manlove, Divers Institute of Technology, Dept. S, P.O. Box 70312, Seattle, Wash.)

December 7-15

YMCA Instructor Institute, Cozumel, Mexico. (Contact: Jan McGinnis, 10010 Memorial #1413, Houston, Tex. 77024)

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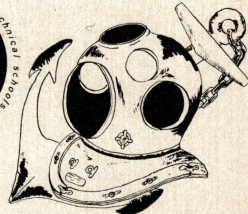
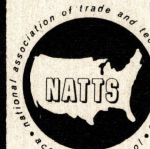
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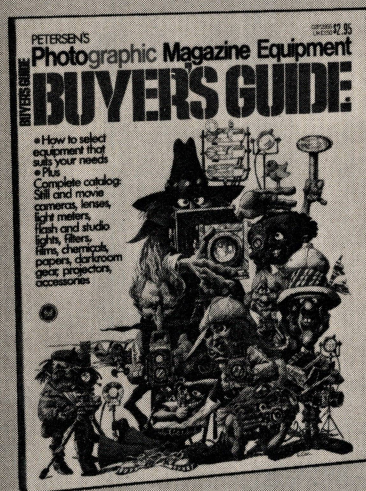
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June 7-9

New York State Divers' Convention, Dunham's Bay Lodge, Lake George, N.Y. (Contact: Jeff Meuwissen, Box 22, Northville, N.Y. 12134)

June 15-16

7th Annual National Association for Cave Diving Seminar, Jacksonville, Fla. (Contact: Robert Woolf, 5018 Kerle St., Jacksonville, Fla. 32601)

June 22-29

CEDAM Annual Meeting and Symposium, Club Akumal Caribe. (Contact: Cedam International, 5820 Burning Tree, El Paso, Tex. 79912)

September 21

NAUI U/W Film Review, Fall Edition, John Hancock Hall, Boston, 8 p.m. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Mass. 02117)

October 4-6

NAUI 6th International Conference on Underwater Education, San Diego, Calif. (Contact: NAUI Hdqrs., 22809 Barton Rd., Colton (Grand Terrace), Calif.)

October 19

Underwater Film Review, Fall Edition, Columbia University, New York City, 8 p.m.; symposium, 11 a.m.-4 p.m. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Mass. 02117)

November 9

NAUI Underwater Symposium & Film Review, Philadelphia, Pa. (Contact: NAUI Mid-Atlantic Branch, P.O. Drawer C, Deepwater, N.J. 08023)

July 6-10, 1975

Vith Symposium on Underwater Physiology, Hotel del Coronado, San Diego. Jan. 31, 1975, deadline for receipt of contributed abstracts. (Contact: Secretariat, Vith Symposium on Underwater Physiology, 9650 Rockville Pike, Room 200, Bethesda, Md. 20014)

CHAMBER SEMINAR

A week long seminar will be held June 17 to 21 at the Commercial Diving Center (CDC) in Wilmington, California, to attack the problem of incomplete training of hyperbaric chamber operators. "It is imperative," said CDC director Jim Joiner, "that the men who operate hyperbaric chambers have the benefit of the most current knowledge and training available."

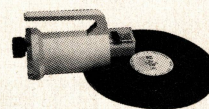
The four major areas to be covered during the program are: diving physiology, practical aspects of diving medicine, treatment of diving casualties, and advanced systems. A staff of experts will lead the seminar for divers, support crews, and supervisory personnel. For more information contact: Jim Joiner, Commercial Diving Center, 272 S. Fries, Wilmington, Calif. 90744.

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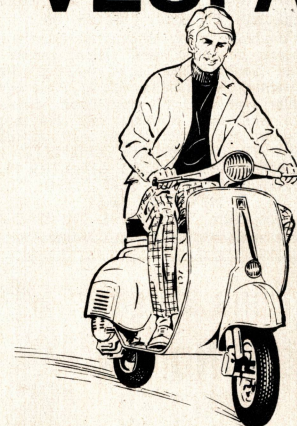
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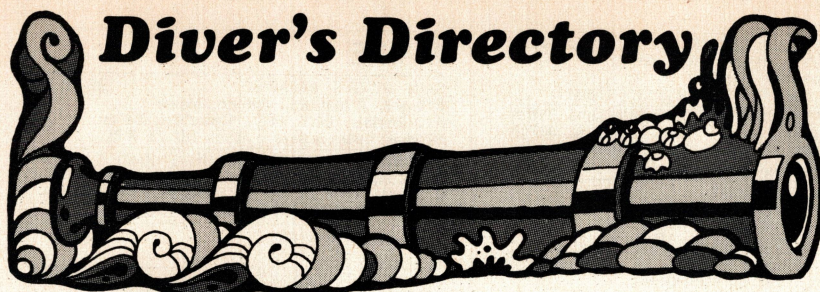
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Technifacts from a Master Diver

BY E. R. CROSS

The basic purpose of this column is to stimulate an interest in the technical aspects of diving, and will be devoted to providing factual answers to questions from SKIN DIVER readers. Answers will be designed to apply to the majority of diving situations, problems, and equipment encountered today. Single subject questions are best suited to Technifacts, and may be on any subject related to diving. Watch for your answers in Technifacts.

For their questions or comments used in this month's Technifacts I would like to thank Kenneth A. Solberg, Minneapolis, Minn.; James F. DeClerck, Spencerport, N.Y.; Ray Wales, Wichita Falls, Texas; Michael Smalky, Grand Prairie, Texas; Gary Paul, Chattanooga, Tenn.; and Al Lauck, Malibu, California.

For the past year or so my research and writing in reply to readers' Technifacts questions have been terribly neglected. This has been due to many things: a busy schedule of underwater jobs, technical consulting assignments, and other less interesting but time consuming things. Now time is again available to concentrate on and do justice to the thoughts and questions of Technifacts readers.

In the next few months I would particularly like to have readers send in questions, comments, and experiences related to bends and their treatment. If you know of a scuba diver, or other diver, who has been bent, whether treated or not, and if treated, how, I would like to have as complete information as possible: about the dive, the decompression, the treatment (if any), and the final results. Anything and everything about the bends and related activities.

Another area about which I would like to have as much feedback as possible is divers' air; taste, smell, any reaction (however slight) while diving, how many other tanks of air were filled and used with or without affecting divers at the same time from the same air station, and the frequency in getting "bad air" from the station. This is not an attempt to pinpoint scuba air filling stations that may be providing air that is not up to what you think it should be. Rather it is an attempt to find out the general

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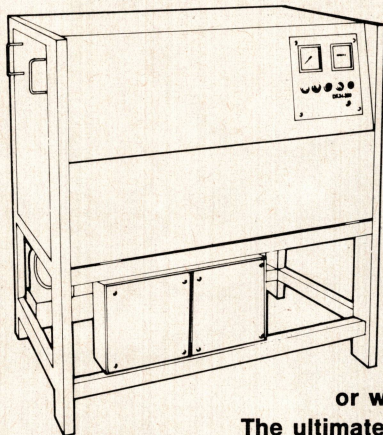
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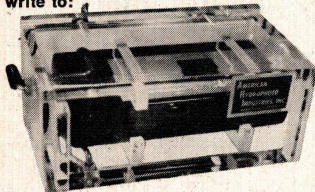
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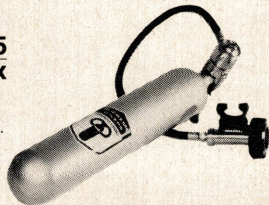
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Technifacts

quality of divers' air throughout the country. Therefore, the name of the air station is not needed. Just the frequency of air that is less than good and any effect it may have had.

Job Opportunities for Professional Scuba Divers. In past months several divers have written to Technifacts regarding the possibilities in professional diving, both in construction and in the marine sciences. In the June, 1973 issue a course was discussed for marine technicians. A reader wrote, "Could you tell me more about the training time required to complete such a course as described? Could you also list a few schools in the southeastern states where such skills could be obtained?" Another reader requested similar information.

The training course described in the June Technifacts was that given at the Leeward Community College in Waipahu, Oahu, Hawaii. This is about 20 miles west of downtown Honolulu. The course is a two year, full-time course. Since writing the June, 1973, Technifacts the course has managed to include more field and "on board" work than previously. I have no information at present on similar courses being given in other areas of the United States. Perhaps Technifacts readers can provide names of schools with marine technician courses.

Another reader wrote stating, "I am planning on going into some underwater trade and am a qualified scuba diver. Can you suggest a good trade school?" Also questions were received asking, "How do diving schools (commercial) relate to the field of commercial diving?" Other questions related to the number of diving jobs available with relation to the number of job possibilities advertised by the various diving schools, whether or not the commercial diving schools actually graduated students fully qualified for this work, and are there other routes open to a diver who wants to break into commercial diving fields.

Each year the field of commercial diving changes so drastically in concept that what was true ten years ago is not so today. In fact, more changes have come about in the field of commercial diving in the past dozen or so years than in all the rest of the history of diving. The changes are not just limited to the type of work.

One of the big changes has been

in the type of person becoming a commercial diver. The modern commercial diver is well educated, possibly a college graduate, highly skilled in mechanical trades, and must be a well disciplined person and be in excellent health and physical condition. He may also have a business background.

Drastic changes have also occurred in the equipment the commercial diver uses to permit work underwater. Probably no more than 10 percent of all commercial diving is now done with the old style helmet gear. It is estimated that 50 percent or more of all diving jobs are done with scuba, and the balance by divers wearing band mask gear or the new fiberglass, lightweight helmets. Scuba, band mask, and lightweight helmets may be equipped with either surface air supply or diving tanks. They may use compressed air, helium-oxygen, or more sophisticated breathing gases.

The concept of keeping a diver warm enough to work in very cold water has also changed. Once the diver was dressed in two or three layers of woollens under the old canvas and rubber dress. Now warm water is circulated through a wet suit similar to those worn by conventional sport divers. The emphasis is on keeping the diver warm, not dry.

Another concept that has changed drastically is the duration of a working dive. A few years ago a "day's work" for a diver was the optimum exposure time set forth in the U.S. Navy Diving Manual. Now a diver may stay at the working pressure, although not necessarily on the ocean bottom, for as long as 30 days in U/W habitats or saturation diving complexes.

There are five major commercial diving companies in the world that employ about 2000 persons, 600 of whom are divers. According to a recent article, an additional 100 companies employ an average of ten persons each, or 1000 persons, most of whom are divers. And there are probably another thousand free-lance divers who work from job to job or more or less part-time. One recent estimate was that the big five diving companies performed 90 percent of all offshore oil field diving, with the smaller companies doing most of the other work. This estimate also implies, indirectly, that most of the high earnings in diving are by the divers working for the big five since it is in the offshore oil industry that deep diving, saturation diving, and high earnings are made.

Where do these divers come from?

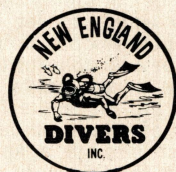
(Continued on Page 74)



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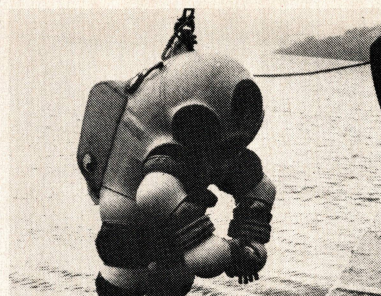
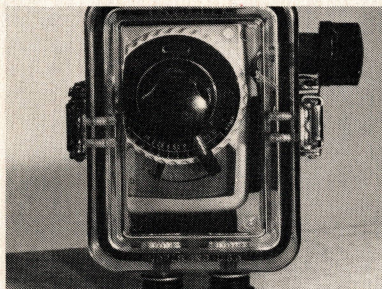
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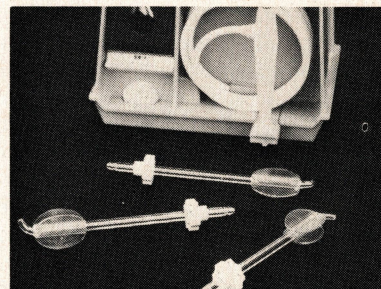
We're into making diving a safer sport.

Ikelite has a new combination light meter and housing featuring a Toshiba CDS meter for use with most types of film and cameras. The meter has an ASA scale from 6-6400, indicates f-stops from 1-32, shutter speeds from eight minutes to 1/8000 second, 55 degree angle of coverage, direct and incidental reading of the surface. Meter with housing is \$59.95. Contact: Ikelite, 3303 North Illinois St., Indianapolis, Ind. 46208.

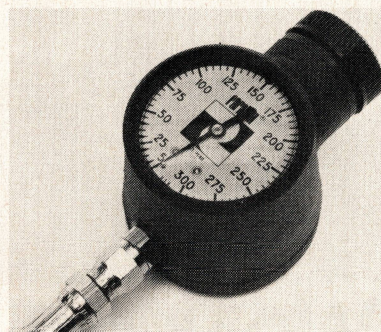


Deep diving can be carried out in safety and comfort with a mobile articulated suit from Britain that is designed to operate freely at depths down to 1000 feet. It allows a diver to work at normal atmospheric pressure and to surface rapidly without having to undergo decompression. The unit, nicknamed Jim, weighs 910 pounds, is six feet, six inches tall. Contact: British Information Services, 845 Third Av., New York, N.Y. 10222.

A sore throat or stuffiness cannot only spoil a dive, it can cause it to be postponed completely. Before throat problems get that bad, many divers use Grossan's Throat Irrigator Tip. The tip is attached to the handle of a Water Pik and acts to physically remove surface bacteria from the throat and tonsils. Pulsation effects act as massage to drain waste products. \$2. Contact: Grossan Inc., 8930 S. Sepulveda, L.A., Cal. 90045.



Aqua-Craft's Buddy Mirror lets you have 360 degree vision to check on your buddy, reserve valve, or even whether a boat is right above. This unique wrist mirror has a curved face to give wide angle coverage. Securely mounted in a black non-corrosive case, mirror fastens to wrist with a nylon strap, solving problem of underwater tunnel vision. Priced at \$5.95. Contact: Aqua-Craft, 3280 Kurtz St., San Diego, Calif. 92110.

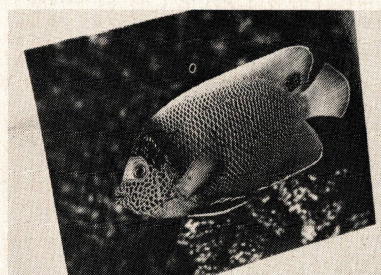


Farallon's illuminated pressure/depth gauge combo contains a separate light module, powered by a PX-30 battery, with a 'press to illuminate' switch, a 300 foot oil filled depth gauge, and a 4000 psi pressure gauge. The three components are held in place by a textured neoprene cover. Luminous gauge faces plus the bright lighting are great for night diving. \$82.95. Contact: Farallon, 1333 Old County Road, Belmont, Calif.

The Cozumel buoyancy compensator from Stebco has a one and a quarter inch diameter hose, mounted off-center mouthpiece for adding or venting air to achieve neutral buoyancy, and an inflator and cartridge assembly which is horizontal to accept a tank inflation system. Large relief valve compensates for over-inflation, is recessed to prevent snagging. \$54.95. Contact: Stebco Industries, 1020 W. 40th St., Chicago, Ill.

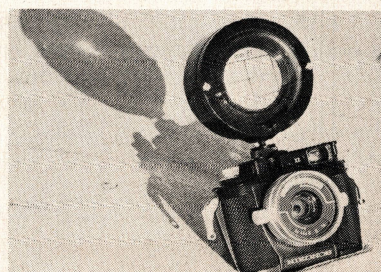


The Helle Mouth Mask is a specially designed scuba mask that covers the diver's mouth. The primary function of the mask is to allow the mouth to move freely for underwater communications, such as with the Hellephone. Any single hose regulator can be inserted into front of the mask. Mask replaces regulator mouthpiece for more comfortable diving. \$33. Contact: Helle Engineering, 7198 Convoy Ct., San Diego, Ca. 92111.



Creative Photo is marketing a new line of Christmas cards for the diver who wants to let the world know about his hobby. Four different cards will be available for the 1974 season: three of the cards will feature marine life, while the fourth features a pair of divers silhouetted by a sunburst through a kelp forest. Retail price for 25 cards is \$7; for 50 is \$13; and for 100 is \$24. Contact: Creative Photo, Box 40, Concord, Ca.

From the growing inventory of Scuba Specialties comes the Marine Viewer for the Nikonos camera. The housing is cast aluminum with epoxy finish, stainless hardware and locks neatly on accessory shoe with a safety jam nut. It allows full 35mm viewing so the camera does not have to be held close to your mask. Nitrogen filled lens and dome. The retail price is \$36.95. Contact: Scuba Specialties, 10956 El Nopal, Lakeside, Ca. 92040.

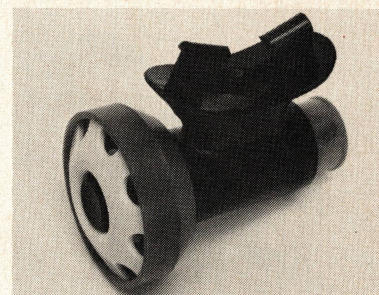


An extra-large diver's gear bag from AFM Swimaster features attractive blue, high strength expanded vinyl with black piping, and special water resistant backing for long life. Excellent for storage of all diving equipment except cylinders, the bag can be used as a backpack or carried as a conventional side bag. Features internal instrument pockets. \$24.95. Contact: AMF Swimaster, 3801 So. Harbor Bl., Santa Ana, Calif. 92704.

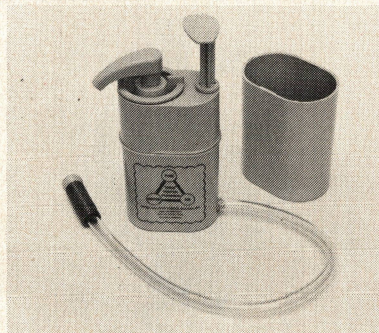


Summer Shopping Guide

Now any air contained in a buoyancy compensator vest can be breathed easily and normally in an emergency situation. The AP second demand valve from England was designed to fit into the oral inflation hose of almost any BC, acts on a diaphragm connected to a rod which opens airway to bag of the vest on inhalation. Button can override valve. \$14. Contact: Parker Hardware, 32 Prior De-ram Walk, Canley, Coventry, England.

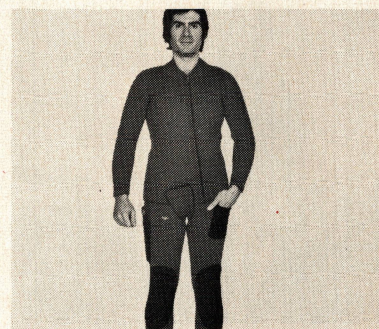


Sea Suits calls this new wet suit Macho — an outgrowth of the suits designed for Skylab's recovery team. Farmer John pants and jacket, highlighted by contrasting arm and leg stripes. Fresh Rubatex available in various color combinations. Nickel plated brass zippers and snaps, double blind stitched and glued seams. Made in 1/8" for \$125; 3/16" for \$135 or 1/4" for \$145. Contact: Sea Suits, 825 W. 18 St., Costa Mesa, Ca.

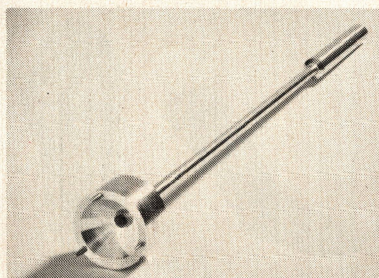
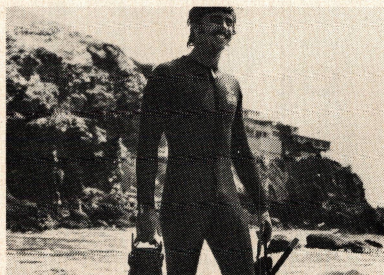


Traveling divers! A new mini portable water purifier may meet your needs for clean, safe drinking water. This unit weights only one pound, and has a strong protective case so it can be carried in your gear bag. It has a ceramic filter and does not need chemicals to filter all bacteria and sediment for your drinking needs. Priced at \$24.95. Contact: Water Pollution Control Systems, Inc., 6350 LBJ Freeway, Suite 122, Dallas, Tex.

Parkway's new Brute Suit is a one piece sleeveless coverall, with a long sleeved jacket. It features knee pads, two accessory pockets and velcro shoulder fastener on the coveralls, and elbow pads, angled zipper and velcro fastened crotch piece on the jacket. Nylon two side quarter inch material available in orange, black or blue for \$170. Contact: Parkway Fabricators, 291 Brunswick Avenue, Perth Amboy, New Jersey 08861.

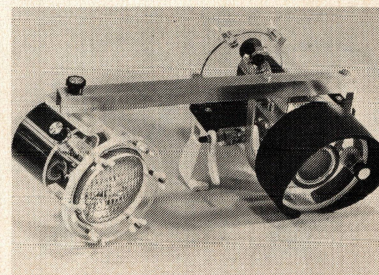


An excellent, and often overlooked solution to diving needs, is a one piece diving suit. Sea Suits makes a wet suit with the shirt attached to the pants of nylon one side, Ruff-Tex exterior, crotch and underarm inserts, and front zipper. It is easy to put on and to take off, is comfortable as a pair of jeans. Made in 1/8" for \$59.95; 3/16" for \$69.95, 1/4" for \$79.95. Contact: Sea Suits, 825 W. 18th St., Costa Mesa, Calif.



The all aluminum Bottom Probe/Shark Billy is a new concept in underwater utility and protective equipment. Divers will find innumerable uses as a positioning aid to push off bottom, as a tow assist bar, or as an extended hand for probing. When used as a billy, small points grip the skin of a shark or large fish to push it away. Priced at \$18. Contact: Guilden Development Co., 310 E. Elizabeth Ave., Linden, New Jersey 07036.

Ryan Products introduces a self-contained underwater movie light designed for the sport diver. The unit utilizes a General Electric six volt 100w sealed beam bulb rated at 3400 degrees K. Power is supplied by five sealed nickel cadmium batteries. The light can supply approximately 13 minutes filming time. Kit includes light, charger and mounting bracket. \$93. Contact: Ryan Products, Box 6506, Columbus, Georgia.



As abalone become harder to get, it takes a tougher iron to pry them out. Aqua-Craft has tackled this problem head on by developing a new hefty ab iron made from quarter inch steel which is virtually impossible to bend. The ab iron is deeply stamped with the California ab sizes, so is a legal measure, and comes with a convenient wrist band. Retail price is \$3.95. Contact: Aqua-Craft, 5258 Anna St., San Diego, Calif. 92110.

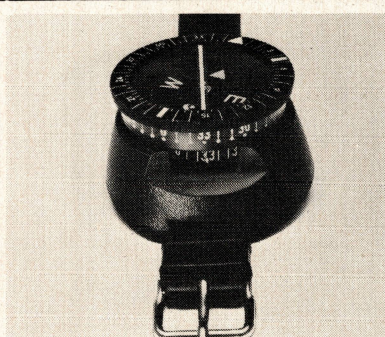


The all new Twin Tank Harness from U.S. Divers gives complete working freedom under all diving conditions. Lightweight and sturdy, the harness features corrosion-resistant bands and new tank band covers. Catalog #0812 is for 6.9 inch diameter cylinders only; #0827 is for 7.25 inch diameter cylinders only. Both twin tank harnesses retail for \$19.95. Contact: U.S. Divers Co., 3323 West Warner Ave., Santa Ana, Ca. 92702.

Scubapro's Close-Up mask has an innovative design that brings the lens closer to the divers' eyes than any other mask in their line. Great for free divers, this exclusive design provides a larger field of vision and less displacement than conventional masks. Available in black only, the Close-Up mask costs \$16 with a purge valve, or \$15 without a purge valve. Contact: Scubapro, 3105 East Harcourt, Compton, California 90221.

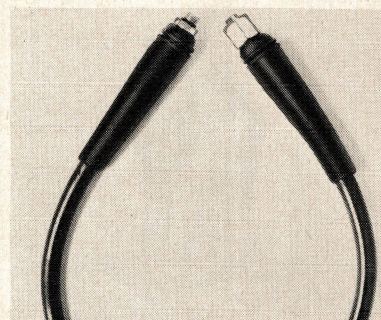


The Sea Diver wet suit sports the professional appearance of royal blue and black two sided nylon. The slip-over jacket has an inverted zipper and high turtleneck collar. The Velcro fastened Farmer John bib-style pants provide extra warmth. Made in quarter inch nylon two sides, sizes Extra Small, Small, Medium, Large and Extra Large. Priced at \$145. Contact: U.S. Divers Co., 3323 W. Warner Ave., Santa Ana, Calif.

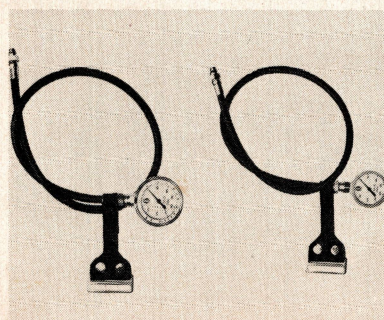


The LS-1 compass from Scubapro is a combination top and side reading compass. This convenience offers the diver the choice and advantage of being able to read the compass course while looking straight ahead, or looking down into the top of the compass. Movable sighting lines, liquid filled and stability make the LS-1 very reliable. Luminous. Priced at \$30. Contact: Scubapro, 3105 E. Harcourt, Compton, California 90221.

The strain and wear on critical stress areas of regulator and submersible gauge hoses can be a real safety hazard for divers. To reduce this problem, Scubapro has designed a new Protective Rubber Sleeve which can be used for both low pressure and high pressure hoses. This rubber sleeve, which is Scubapro catalog number 108-75, retails for only \$1.30. Contact: Scubapro, 3105 E. Harcourt, Compton, California 90221.

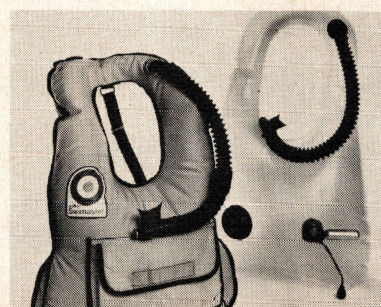


The Pro Dive I is a right angle tank pressure gauge designed to swivel 360 degrees, has a luminous face and 3500 psi service. Bourdon tube indicating mechanism. Priced at \$40.95. The Pro Dive II has the same design features as the Pro Dive I, with the addition of a capillary depth gauge which reads to depths of 200 feet. The Pro Dive II is priced at \$45.95. Contact: U.S. Divers Co., 3323 W. Warner Ave., Santa Ana, Ca. 92702.



Diving boots need to be a lot more than comfortable. Boots should be warm, durable and provide a secure walking surface. The new Moulded Sole boot from Scubapro is designed to actual physical contours of the foot. Completely pliable providing unprecedented comfort while diving or walking topside. Made of 3/16 inch nylon two sides, sizes six through eleven. \$20. Contact: Scubapro, 3105 E. Harcourt, Compton, Calif. 90221.

A new buoyancy compensator vest, the 3-D BVC from AMF Swimaster, features a three dimensional design for maximum 38 pound inflation and double bag construction to better guard against puncture, tearing and abrasion. For added safety, the vest comes with a large over-pressure relief valve, and a non-corrosive CO2 cartridge detonator for emergency use. \$75. Contact: AMF Swimaster, 3801 S. Harbor, Santa Ana, California.





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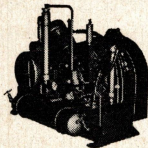
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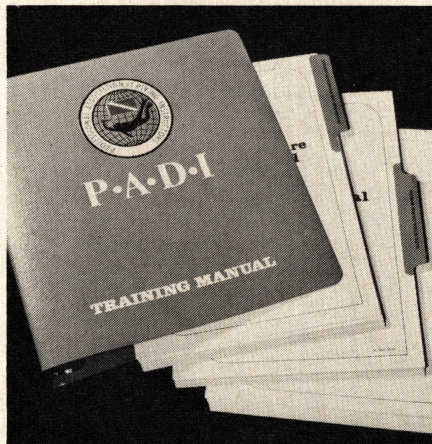


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The *Open Water Training Manual* encompasses all of the PADI required skills through advanced open water training, and provides gradual progressive open water training to achieve full student competency. All skills are completely detailed and are based on logical application of practical open water techniques. PADI has pioneered open water training with its advanced course since 1967, and is continuing to provide new and necessary concepts in the diving field.

The *PADI Training Manual* is limited to PADI instructors. However, instructors certified by other nationally recognized organizations, and approved by the PADI Board of Directors, can obtain the *Manual* through cross certification, which is being extended through 1974. For more information, contact: PADI, Box 177, Costa Mesa, California 92627.

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74 SKIN DIVER/JUNE 1974



Technifacts

(Continued from Page 69)

Until 15 years ago most commercial divers came from a diving school or were trained on the job. Seldom did military divers break into the commercial fields. In the past 10 years there has been an increase in the use of well trained and specially qualified Navy divers, particularly in the area of mixed gas diving. Probably the ex-Navy diver with special qualifications in mixed gas and saturation diving will spend most of his time on the mixed gas manifold rather than underwater. But at least he is in commercial diving.

The modern commercial diving school provides graduates who, according to a recent Oil and Gas Journal article, " . . . do a creditable job of screening and basic training." I think it is very important for the prospective commercial diver who is contemplating attending a diving school to remember those words, "screening and basic training." That is about all any school, diving or other, can do for a student. But those qualifications alone will help the graduate get a job. Then it is up to him to make the grade as a commercial diver.

There is always a shortage of divers qualified in planning and supervising complex diving jobs. The scope of work and skills involved in such a project is so extensive that only a person with many years of experience can hope to cope with the myriad problems. In this area a diver having an educational background in mechanical engineering (but not necessarily an engineering degree) and with business experience to help him cope with personnel problems, safety regulations, insurance requirements, OSHA, and labor organizations and laws would be best suited. Then too, there is the problem of having such a qualified person who simply wouldn't want to cope with all those problems. He'd rather be a diving diver.

Research is presently being conducted by Technifacts in preparation of a series of Technifacts columns devoted to the many aspects of commercial diving as it is conducted today. Readers are invited to contribute thoughts and questions they may have in this area. Particularly items you would like to see covered.

Ice Diving Problem! Apparently the under-the-ice divers have been active during the past winter. One reader wrote asking, "Why would a U.S. Divers Calypso or Calypso J regulator free

flow while being used in icy water?" Another reader wrote saying, "While diving to moderate depths in Lake Superior and ice diving in Minnesota, almost all members of our club using single hose regulators suffer regulator freezing. Those individuals using double hose regulators don't seem to have this problem. What is the cause of the failures and why don't the double hose regulators have this problem?"

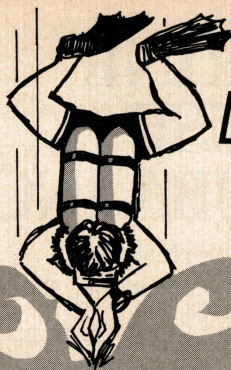
When high pressure air passes through an orifice and is allowed to expand with greatly reduced pressure, it cools drastically. If it cools enough any moisture in the compressed air condenses and when the temperature of the air is near freezing, as when under the ice in near freezing water, the condensate forms ice. The ice crystals can then block the valve seat and let the regulator free flow.

Probably the two hose regulators did not "freeze up" because of mechanical differences and size of the valve seats rather than because of the size of the diaphragm. I believe I have heard of two hose regulators freezing up in past years. Technifacts would appreciate hearing from other divers about this problem.

Will a Galvanized Diving Cylinder Rust Under a Boot? Yes, if the boot is left on for long periods of time. I recently inspected a galvanized diving tank that had had a boot on it for several years. Under the boot, pits caused by corrosion were found that were deep enough the tank was no longer suitable for diving.

My personal experience with tank boots is that they are not normally required, and most of the time conditions indicate they should not be used. It is potentially hazardous to leave a scuba cylinder, charged to over 2000 psi, free standing in a boot. If the tank were to be knocked over, the consequences could be drastic. Also, when diving tanks are stacked in a pile on their sides, the use of a boot makes the bottom of the tanks greater in diameter, and the top of the tanks point downward making it easier for the tank to slide out of the stack. If a tank must be left stored upright, whether with or without a boot, it is best to properly secure the tank to some fixed object by the use of a small rope or wire.

Book Available on Care and Maintenance of Scuba! Last year a small manual titled *Scuba Equipment Care and Maintenance* was published by Petersen Publishing Co., 8490 Sunset Blvd., Los Angeles, Calif. 90069. It is listed as Spotlight Book No. 627. The small manual contains many excellent tips and instructions on the care and maintenance of all diving equipment.



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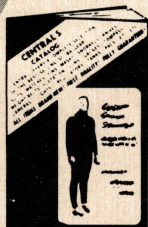
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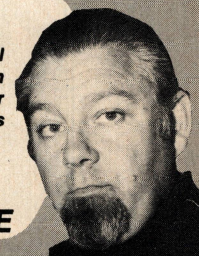
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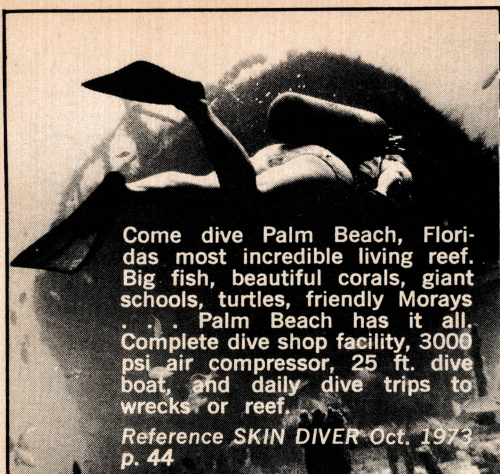
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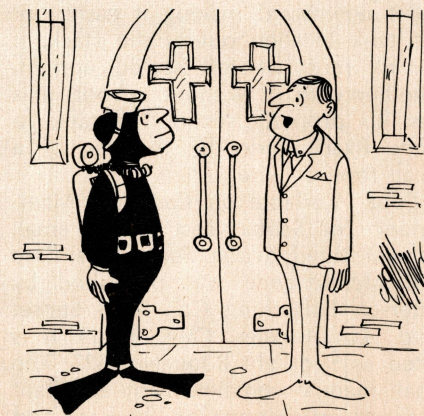
U.S. Aquanauts has announced the opening of its second full service scuba store in the Miami area. Located at 7825 S.W. 40 Street (Bird Road), South Miami, this modern store front faces the newly proposed City of Miami recreational complex, and offers sales, service and air station. Certified instruction, ranging from basic scuba training to advanced scuba and special interest diving, is taught through their Mondo Silente diving school.

Visitors to Aquanauts' new location



were greeted by Rick Frehsee, U/W photographer; Martin Conley, U.S. Divers; and Dick Holcomb, SKIN DIVER. Free door prizes, special grand opening sales, and complimentary copies of SKIN DIVER to new customers made the opening a success.

With only two months of sales in the new location, Jesus Otero announced that he intends to open a shop in a third location, at 18 N.E. 2 Avenue at Hillsboro Blvd., Deerfield Beach, Florida 33441. Services will be the same at this east coast location, and all stores feature 20 cfm Worthington air compressors capable of pressures up to 5000 psi. All stores are also members of the Aqua-Lung Dealers Association (ALDA). For more complete information about services and sales, write to: Jesus Otero, President, U.S. Aquanauts, 971 S.W. 1 St., Miami, Fla. 33130.

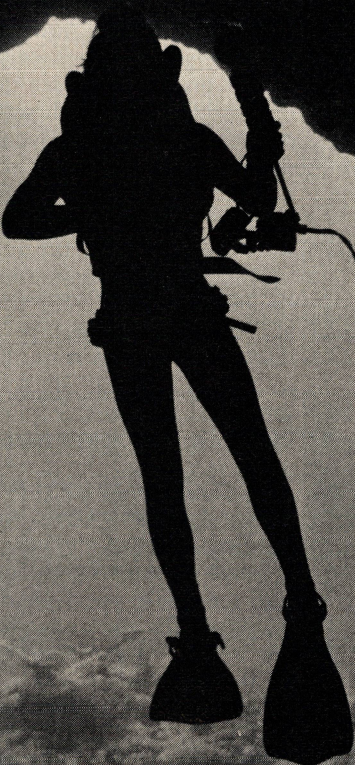


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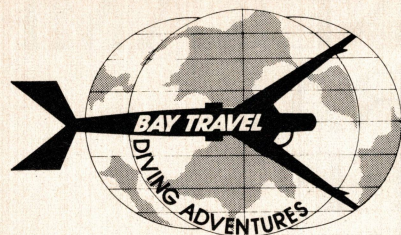


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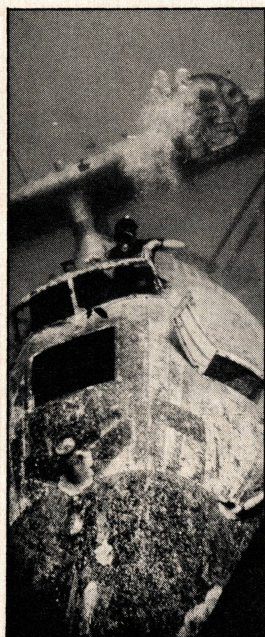
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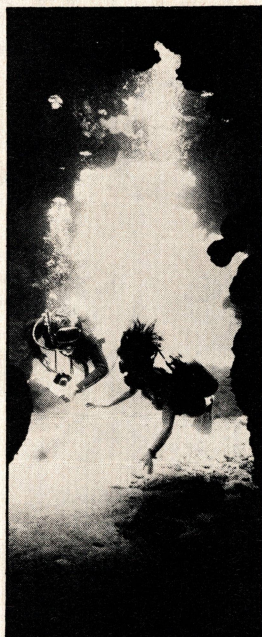
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RESORT PRO

Mike Eyring is the senior diving instructor and manager of Bob Soto's Diving Lodge in the Grand Cayman islands. Mike is a former chemist and productions manager who decided to make the sea his home. He teaches diving for the YMCA, NAUI and PADI, and has spent many years in tour direction and dive school management.

Every day's diving at Bob Soto's Lodge is planned with your's and the group's special interests and diving pleasure in mind. Helping Mike in this effort is his wife, Donna, a former executive secretary who gave up her typewriter and nerves for the sand and sun, and who is a skilled diver.

Says Mike: "The key here is physical pleasure, not fitness, and a 'hero' manager won't be in business long. We have to take individuals with all ranges of age, knowledge, experience and condition, and show them a good, safe, exciting time." ➤

BONAIRE'S YMCA COURSE

Aquaventure, Bonaire, N.A., not only provides exceptional diving for those who are qualified, but offers a complete YMCA certification course for prospective divers. This certification course, which begins the first Saturday of each month, includes five full days of diving theory and practical underwater experience.

A. Bruce Bowker, who is in charge of instruction at Aquaventure, feels this course produces very competent reef divers because even the pool work is done in a natural setting. This is possible because Aquaventure's swimming pool is 450 feet long, 200 feet wide, 110 feet at the deep end, and loaded with coral and fish. The open water work is held on Bonaire's reefs.

This YMCA course runs 45 to 50 hours, at a cost of \$120 which includes all equipment, dive trips, and a night dive for the graduates. For more information contact: Bill Kielman, Royal Caribbean Services, 609 Fifth Ave., Rm. 712, New York, N.Y. 10017. ➤

SEACOMBERS SAFARIS

In the past few years skin diving has developed into a major sport. More and more people have found an escape into the silent world under the surface of the sea. Many divers have explored the beauty of the Caribbean and the Pacific Ocean, while others have combed the clear blue waters of the Mediterranean. But very few have ventured into the Indian Ocean, for most of it lies off the beaten track. However, it is the Indian Ocean which offers divers perhaps the most fascinating opportunities of all for spearfishing,

shell collecting, underwater photography and marine biology.

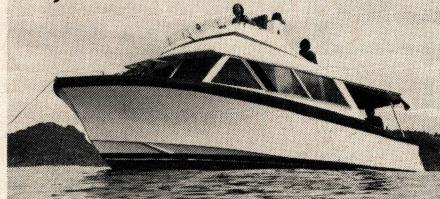
To enable you to explore all its wonders, and at the same time to savor something of Africa and the exotic islands off its coast, Seacombers Safaris of Cape Town, South Africa, has devised a number of underwater safaris which will take you to strange and fascinating places.

On these safaris you can visit the Cape of Good Hope at the southern tip of Africa, the world famous Kruger National Park with its teeming wildlife, the Comoros and Seychelles islands, Madagascar with its spices, and the beautiful Maldive Islands near Ceylon. The length of the safaris varies from 15 to 21 days, and they can be planned to your interests.

All the safaris start in Cape Town with guides Arthur Ridge, Clive Booth or Norman Wrangmore. The price of each tour includes accommodation in executive suites in the center of Cape Town, all transport and meals, all diving excursions and boat cruises mentioned in the itinerary, and diving equipment such as tanks, back packs, weights, air refills, etc. Air fares are not included in the price.

Seacombers Safaris was started by Cape Town's Atlantic Underwater Club to cater for the individual needs of the worldwide diving fraternity. For more information contact: N. L. Wrangmore, Seacombers Safaris, P.O. Box 1413, Cape Town, Republic of South Africa.

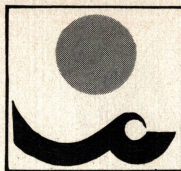
FIJI — TOP DIVING



New facilities, boats and diving bases have placed Fiji firmly on the international diving map. Scubahire has expanded its Suva facilities and opened a new branch at Lautoka, on Viti Levu's northwest coast. Lautoka is near to Nadi International Airport, and is the jumping off place for the islands in the Mamanucas and Yasawas.

Scubahire's Suva facility, based at Tradewinds Hotel, has now been in operation for four years. Expansion includes the addition of extra gear which can easily cater for groups of 15 or more divers, and the installation of a one-man decompression chamber.

Scubahire has three boats for diving charter: *Sundowner*, a 27 foot high speed cruiser; *Bonita*, a 18 foot high speed runabout, and *Sta Reta*, a 40 foot motor sailer. For more information contact: Scubahire Limited, GPO Box 777, Suva, Fiji.



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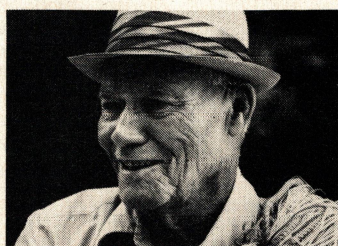
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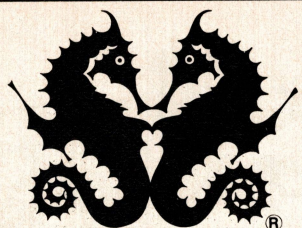
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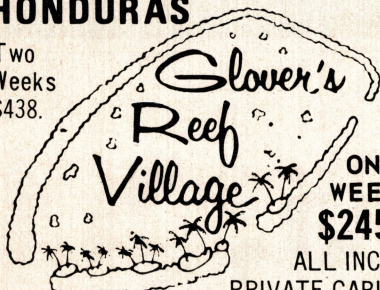
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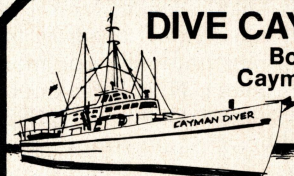
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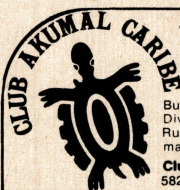
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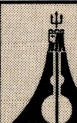
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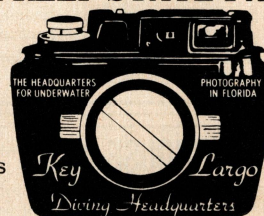
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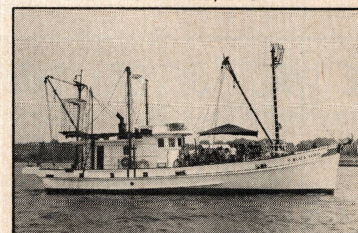
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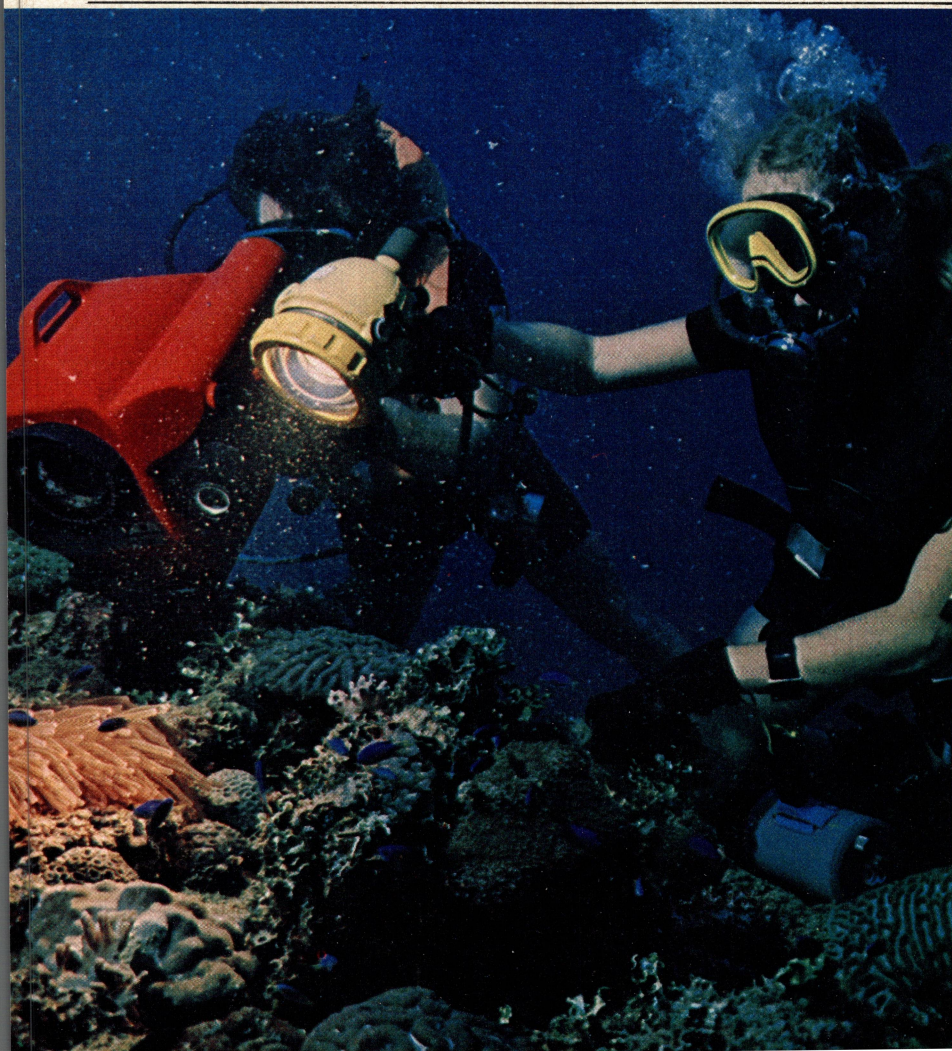
Dive Tour News



June 1 — HONDURAS — 7 days, Divers Corner, Downey, Calif.
 June 7, 14, 21, 28—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
 June 7—BONAIRE/CURACAO—9 days, Loyal Travel, Inc., San Antonio, Texas.
 June 8—SPANISH HONDURAS—6 days, Grand Am Int'l Tours, Ocala, Fla.
 June 8—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
 June 8, 15 — HONDURAS — 7 days, Cap'n Frogs Swim & Dive Shop, Roseburg, Ore.
 June 10—HAWAII/KONA—8 days, See & Sea Travel, San Francisco, Calif.
 June 11—HAWAII/KONA—8 days, Photomarine Int'l Travel, Reseda, Calif.
 June 11 & 25—TRUK/PONAPE—11 days, Inner-space Adventures, Hickam, Hawaii.
 June 13—VIRGIN ISLANDS—12 days, Sierra Club, San Francisco, Calif., Trip #382.
 June 14—RIO DE JANEIRO, BRAZIL—14 days, Sunland Int'l Tours, Beverly Hills, Calif.
 June 14—COZUMEL/YUCATAN — 7-12 days, See & Sea, San Francisco, California.
 June 15—CAYMAN BRAC—8 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 June 15—BRITISH HONDURAS—8 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 June 15 — TRUK/PALAU — 15 days, Atlantis Safaris, Miami Shores, Fla.
 June 16—AKUMAL—7 days, Underwater Explorers Society, Pompano Beach, Florida.
 June 16—COZUMEL—7 days, Chalet Club, New York, New York

June 17 — AKUMAL — 10 days, Photomarine Int'l Travel, Reseda, Calif.
 June 17—SEA OF CORTEZ—11 days, Sierra Club, San Francisco, Calif., Trip #337.
 June 19—BIMINI—10 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
 June 22—CAYMAN ISLANDS — 8 days, Dewey Bergman, See & Sea, San Francisco, Ca.
 June 22—CAYMAN BRAC—8 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 June 22—BONAIRE/CURACAO—9 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 June 22 — COZUMEL — 7 days, Skin Diving School, Bronx, N.Y.
 June 22 — HONDURAS — 7 days, Tackle Shack, Pinellas Park, Fla.
 June 23 — COZUMEL — 7 days, Go Mexico, Inc., Minneapolis, Minn.
 June 24—GRAND CAYMAN—10 days, Sierra Club Outings, San Francisco, Calif.
 June 24—PANAMA/SAN BLAS—10 days, Photomarine Int'l Travel, Reseda, Calif.
 June 26—GALAPAGOS ISLANDS — 18 days, Dewey Bergman, See & Sea, San Francisco, Ca.
 June 28 — COZUMEL/AKUMAL — 8 days, Sunland Int'l Tours, Beverly Hills, Calif.
 June 29—GRENADINES—7 days, Windward Lee-ward Sailing Tours, San Francisco, Calif.
 June 29 — HONDURAS — Neptune Dive & Ski, Inc., North Augusta, S.C.
 July 3 & 15—NASSAU—7 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
 July 4—MAUI & LANAI, HAWAII—11 days, Sierra Club, San Francisco, Calif., Trip #312.
 July 5, 12, 19, 26—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
 July 6—GRAND CAYMAN—11 days, Sierra Club Outings, San Francisco, Calif.
 July 6—BONAIRE/CURACAO—9 days, John Kelley, See & Sea Travel, San Francisco, Calif.
 July 6—BONAIRE/CURACAO—9 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 July 6—NOVA SCOTIA—7 days, Chalet Club, New York, New York

July 6—GRENADINES—7 days, Windward Lee-ward Sailing Tours, San Francisco, Calif.
 July 6 — HONDURAS — 7 days, Michigan U/W Schools of Diving, Lincoln Park, Mich.
 July 7—ROATAN/HONDURAS—7 days, Kathy Taylor, Island Reef Safaris, Wilton, Conn.
 July 11 — VIRGIN ISLANDS — 12 days, Sierra Club, San Francisco, Calif.
 July 12—SPANISH HONDURAS—4 days, Grand Am Int'l Tours, Ocala, Fla.
 July 13—ANDROS, BAHAMAS—7 days, Under-water Safaris, Boston, Mass.
 July 13—COZUMEL/YUCATAN—8 days, Anchor Shack, See & Sea Travel, San Francisco.
 July 13 — HONDURAS — 7 days, Ski & Dive, Inc., Alexandria, Va.
 July 14—ROATAN/HONDURAS—7 days, Kathy Taylor, Island Reef Safaris, Wilton, Conn.
 July 14—CAYMAN BRAC—7 days, U/W Explorers Society, Pompano Beach, Florida.
 July 16—GALAPAGOS—23 days, Sierra Club, San Francisco, Calif., Trip #340.
 July 18—MAUI & LANAI, HAWAII—11 days, Sierra Club, San Francisco, Calif., Trip #313.
 July 20—CAYMAN ISLANDS—8 days, Bernie Campoli, See & Sea Travel, San Francisco.
 July 20 — BRITISH HONDURAS — 8 days, Sunland Int'l Tours, Beverly Hills, Calif.
 July 21 — COZUMEL — 7 days, Go Mexico, Inc., Minneapolis, Minn.
 July 23 — TRUK/PONAPE—11 days, Innerspace Adventures, Hickam, Hawaii.
 July 27—GRENADINES—7 days, Windward Lee-ward Sailing Tours, San Francisco, Calif.
 July 27 — HONDURAS — 7 days, Aquaspace, Huntsville, Ala.
 July 28—TAHITI/RANGIROA—9 days, Photomarine Int'l Travel, Reseda, Calif.
 Aug. 2—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
 Aug. 2, 30—COZUMEL/AKUMAL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
 Aug. 2, 9, 16, 23, 30—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.



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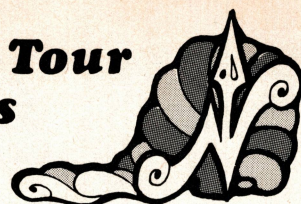
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Dive Tour News



- Aug. 3—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
- Aug. 3 — HONDURAS — 7 days, Colorado Divers World, Denver, Colo.
- Aug. 10—SPANISH HONDURAS—6 days, Grand Am Int'l Tours, Ocala, Fla.
- Aug. 10 — HONDURAS — 7 days, Diving Locker, San Diego/Scubaffair, Laguna Niguel.
- Aug. 12—BIMINI—10 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Aug. 17—CAYMAN ISLANDS—8 days, John Reseck, See & Sea Travel, San Francisco, Calif.
- Aug. 17—BONAIRE/CURACAO—9 days, Peter Capen, See & Sea Travel, San Francisco, Calif.
- Aug. 17 — HONDURAS — 7 days, Cougar Sports, Inc., Bronx, N.Y.
- Aug. 18—AKUMAL—7 days, U/W Explorers Society, Pompano Beach, Florida.
- Aug. 19—AMERICAN & WEST SAMOA—15 days, Sierra Club, San Francisco, Calif., Trip #356.
- Aug. 19—PANAMA/SAN BLAS—10 days, Photomarine Int'l Travel, Reseda, Calif.
- Aug. 20—TRUK/PONAPE—11 days, Innerspace Adventures, Hickam, Hawaii.
- Aug. 24—COZUMEL/YUCATAN—8 days, Gene Foster, See & Sea Travel, San Francisco, Calif.
- Aug. 24—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
- Aug. 24 — HONDURAS — 7 days, Underwater Schools of America, Fountain Valley, Ca.
- Aug. 26—NASSAU—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Aug. 30—COZUMEL/CHINCHORRO REEF—11 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Aug. 30—PUERTO RICO—4 days, Chalet Club, New York, New York
- Aug. 31—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
- Aug. 31 — HONDURAS — 7 days, Aquatics, Ltd., Nashville, Tenn.
- Sept. 2—MARISLA/SEA OF CORTEZ—7 days, Photomarine Int'l Travel, Reseda, Calif.
- Sept. 6—NASSAU—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Sept. 6, 13, 20, 27—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
- Sept. 6—GREEK ISLANDS—17 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
- Sept. 7—CAYMAN ISLANDS—13 days, Dewey Bergman, See & Sea Travel, San Francisco.
- Sept. 7—BONAIRE/CURACAO—9 days, Carl Roessler, See & Sea Travel, San Francisco.
- Sept. 7 — HONDURAS — 7 days, Boca Marine, Inc., Boca Raton, Fla.
- Sept. 9—HAWAII/KONA—8 days, See & Sea Travel, San Francisco, Calif.
- Sept. 13—RIO DE JANEIRO, BRAZIL—14 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Sept. 13—SPANISH HONDURAS—4 days, Grand Am Int'l Tours, Ocala, Fla.
- Sept. 14 — HONDURAS — 7 days, Aquatic Center, Key West, Fla.
- Sept. 21 — HONDURAS — 7 days, Atlantis Diving Center, Philadelphia, Pa.
- Sept. 27—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Sept. 28 — HONDURAS—7 days, Michigan U/W Schools of Diving, Lincoln Park, Mich.
- Oct. 4—MARISLA/SEA OF CORTEZ—7 days, Photomarine Int'l Travel, Reseda, Calif.
- Oct. 4, 11, 18, 25—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
- Oct. 5—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
- Oct. 5 — HONDURAS — 7 days, USAFECO, Salt Lake City, Utah
- Oct. 7—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Oct. 11—COZUMEL/AKUMAL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.



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- Oct. 12—SPANISH HONDURAS—6 days, Grand Am Int'l Tours, Ocala, Fla.
 Oct. 12—COZUMEL/YUCATAN—8 days, Van Worley, See & Sea Travel, San Francisco, Calif.
 Oct. 12—BONAIRE/CURACAO—9 days, See & Sea Travel, San Francisco, Calif.
 Oct. 12—ROATAN/HONDURAS—6 days, Chalet Club, New York, N.Y.
 Oct. 12—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
 Oct. 12 — HONDURAS — 7 days, Underwater Schools of America, Fountain Valley, Ca.
 Oct. 19—CAYMAN ISLANDS—8 days, Rich Bergero, See & Sea Travel, San Francisco, Calif.
 Oct. 22—AUSTRALIA/CORAL SEA—17 days, Bob Hollis, See & Sea Travel, San Francisco.
 Oct. 22—TRUK/PONAPE—11 days, Innerspace Adventures, Hickam, Hawaii.
 Oct. 26—AFRICA/INDIAN OCEAN—23 days, See & Sea Travel, San Francisco, Calif.
 Oct. 26 — HONDURAS — 7 days, Houston Scuba Academy-West, Houston, Texas
 Oct. 27—TAHITI/RANGIROA—9 days, Photomarine Int'l Travel, Reseda, Calif.
 Nov. 1—ISRAEL/RED SEA—21 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 Nov. 1, 8, 15, 22, 29—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
 Nov. 2—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, Calif.
 Nov. 10—SPANISH HONDURAS—4 days, Grand Am Int'l Tours, Ocala, Fla.
 Nov. 11—HAWAII/KONA—8 days, See & Sea Travel, San Francisco, Calif.
 Nov. 13—MICRONESIA—17 days, Chalet Club, New York, N.Y.
 Nov. 22—COZUMEL/AKUMAL—8 days, Chalet Club, New York, N.Y.
 Nov. 22—COZUMEL/AKUMAL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
 Nov. 23—COZUMEL/YUCATAN—8 days, Ron Merker, See & Sea Travel, San Francisco, Calif.
 Nov. 27—HAWAII/KONA—8 days, Photomarine Int'l Travel, Reseda, Calif.
 Nov. 30—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, Calif.
 Dec. 6, 13, 20, 27—BONAIRE—8 days, Royal Caribbean Services, New York, N.Y.
 Dec. 21—COZUMEL/YUCATAN—12 days, Christmas Program, See & Sea, San Francisco.
 Dec. 21—CAYMAN ISLANDS—13 days, Christmas Program, See & Sea Travel, San Francisco.

JAMAICA'S NEW SCHOOL

The Jamaica School of Swimming, Skin and Scuba Diving was recently formed in Montego Bay, Jamaica. David Heath and John Quinn, two Englishmen with years of diving experience in the Caribbean, formed the school separate from Scuba Jamaica, although the latter will provide the diving services.

The new school offers a PADI certification course in the sun in Montego Bay, at the Palm Beach Hotel. The certification is part of an eight day package which includes: airport transfers, air conditioned hotel room, breakfasts, the full PADI scuba course and unlimited diving after the sixth day. The price of this package is \$323 in the summer, and \$304 in the winter, based on double occupancy.

For families with children, the new school offers junior scuba or skin diver courses. For more information contact: Jamaica School of Swimming, Skin and Scuba Diving, P.O. Box 469, Montego Bay, Jamaica. >

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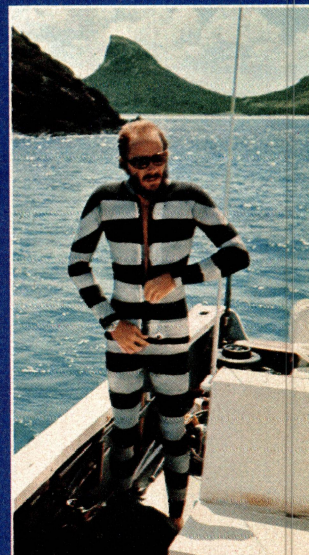
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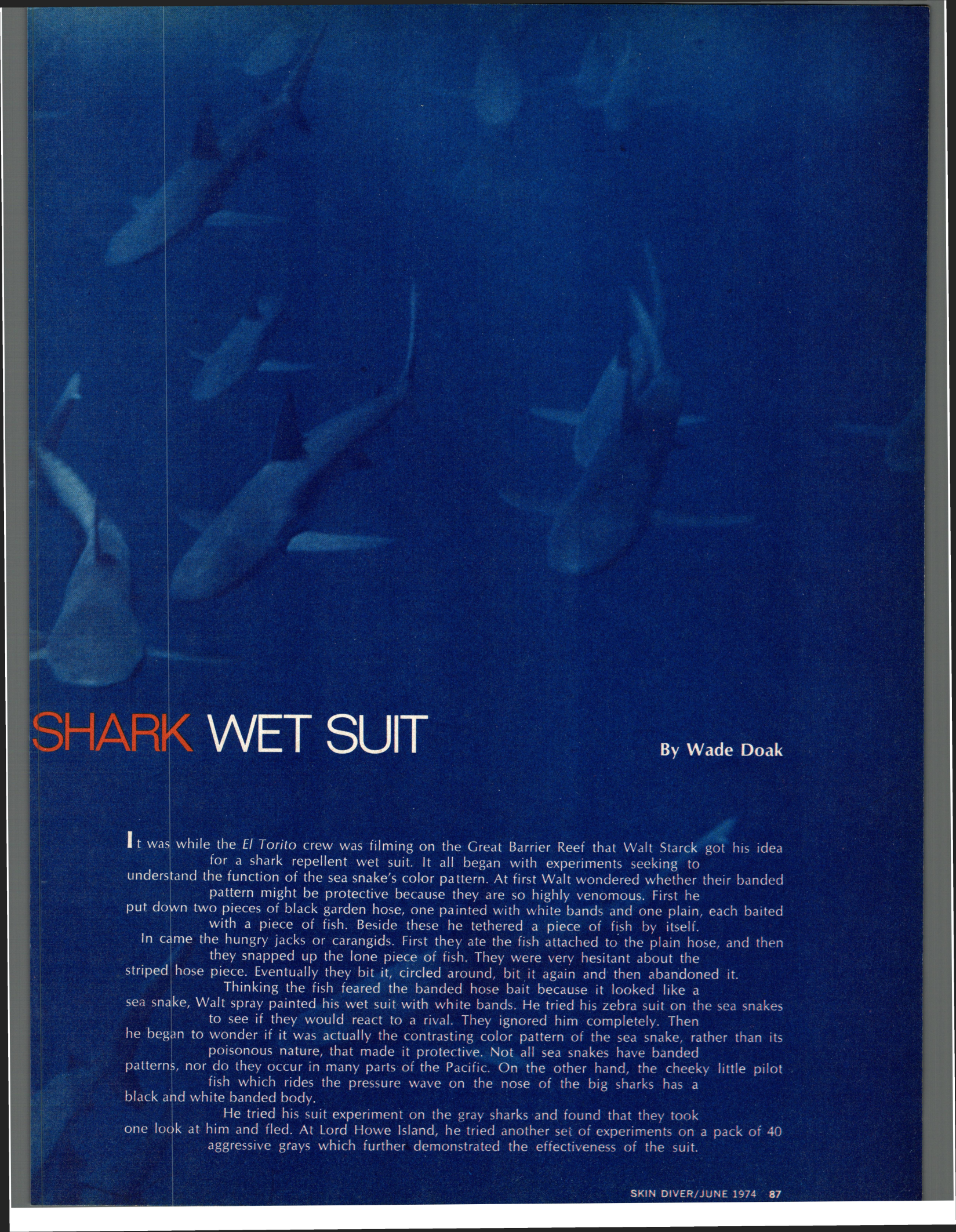
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REVOLUTIONARY WEAPON ANTI-

An armada of 40 gray sharks was encountered by Dr. Starck and the crew of El Torito while filming for TV series "Blue Frontier." The sharks were very aggressive toward the divers, but as Dr. Starck jumped into the water with his "Florida chain gang" suit, they fled. In later experiments, Starck actually tried to attract sharks with a rattle.





SHARK WET SUIT

By Wade Doak

It was while the *El Torito* crew was filming on the Great Barrier Reef that Walt Starck got his idea for a shark repellent wet suit. It all began with experiments seeking to understand the function of the sea snake's color pattern. At first Walt wondered whether their banded pattern might be protective because they are so highly venomous. First he put down two pieces of black garden hose, one painted with white bands and one plain, each baited with a piece of fish. Beside these he tethered a piece of fish by itself.

In came the hungry jacks or carangids. First they ate the fish attached to the plain hose, and then they snapped up the lone piece of fish. They were very hesitant about the striped hose piece. Eventually they bit it, circled around, bit it again and then abandoned it.

Thinking the fish feared the banded hose bait because it looked like a sea snake, Walt spray painted his wet suit with white bands. He tried his zebra suit on the sea snakes to see if they would react to a rival. They ignored him completely. Then he began to wonder if it was actually the contrasting color pattern of the sea snake, rather than its poisonous nature, that made it protective. Not all sea snakes have banded patterns, nor do they occur in many parts of the Pacific. On the other hand, the cheeky little pilot fish which rides the pressure wave on the nose of the big sharks has a black and white banded body.

He tried his suit experiment on the gray sharks and found that they took one look at him and fled. At Lord Howe Island, he tried another set of experiments on a pack of 40 aggressive grays which further demonstrated the effectiveness of the suit.

Lord Howe Island is 400 miles off the Australian coast in the Tasman Sea, and has the southernmost coral reef in the world. In February, 1973, an intensive fish collecting expedition was sent to Lord Howe for the Australian Museum and the Bernice P. Bishop Museum of Hawaii, funded by a grant from the National Geographic Society. A team of ichthyologists, including Drs. John Randall and Jerry Allen, were very eager to join Walt Starck on his 100 ton underwater research vessel for a survey of this unusual area. I joined the group as writer and U/W photographer.

One day a group from *El Torito* went out in a skiff and anchored two miles offshore to make a fish collection. Walt Starck pinpointed our position with the sextant. Three plugs of gelignite were lowered on detonating wires. As soon as the shot was fired, Walt leapt overboard and descended along the anchor line. Those of us with cameras waited to see whether we were on sand or rock bottom, as it would be better to save the descent for elsewhere if it was just a desert. The water was deep blue. Only two fish floated up, one an anemone fish — a sign of foul ground. Barry Russell rolled in, but then jumped out immediately. "Eight sharks right under the boat — have a look!" Dr. Jerry Allen got in. He's seen a lot of sharks during fish collecting wanderings 'round the Pacific. He leapt out too — 32 sharks was his count.

Meanwhile down below us, Walt was gathering fish and wondering where we were. He finally looked up and could see the boat 150 feet above him. Then he saw the armada of sharks. He laughed as he realized why he was alone. He surfaced, and in the ensuing days we began to study this group of gray sharks, *Carcharhinus amblyrhynchos*. Walt was keen to try his zebra suit out on such a large group of these notorious creatures.

These weren't big sharks but they had to be respected. They hadn't read the current shark theories and showed no sign of fear of scuba divers. They just kept coming in slowly and steadily and we had to get out before they came within touching distance. At that stage a mass attack could have easily been precipitated. On one occasion Walter Deas surfaced away from the boat in the middle of a pack of them and one came right in, grabbed his right fin, then let go just as suddenly. Walt didn't wait for it to get a better grip. In no time Walt Starck responded to his shout and was beside him with a hand spear fending off the sharks as they both back-pedaled to the skiff.

On another occasion Jerry Allen and I were watching a shark attack a fish bait that John Fairfax had trailed over the side. The shark swiped at the fish and John jerked it clear. Then the shark came straight at Jerry and me. We found ourselves aboard the skiff, side by side, weights, tank, cameras — the lot!

The day came when we were ready to test the zebra suit. There were 40 grays around us as we hung astern of the skiff in the gentle current. We were ready to climb aboard if things got too hot; in fact, this happened several times and movie film was shot of the action. Then Walt jumped in wearing his black and white banded suit. It was extraordinary! The sharks just melted away down current until not a one was in sight. Walt got out and they reappeared, looming in on us. Seven times he repeated this sequence while John Fairfax filmed him. Each time the sharks withdrew, to reappear when he boarded the skiff.

Further experimentation was done, and a lot of interesting data was acquired on the behavior of these grays. Walt seems to have discovered the first effective shark repellent system. Striped suits may become the in thing

once his film series, "The Blue Frontier," hits the T.V. screens. But our work at Lord Howe Island was completed, so *El Torito* sailed north for the Solomon Islands.

While carrying out his own shark studies, Walt is equally interested in learning what Pacific island peoples may have discovered about sharks: "In our culture it is conventional that sharks are viewed as dangerous, unpredictable animals, at best something to be avoided. In the Pacific islands man has lived for thousands of years in close relationship with sharks. Surprisingly enough in many areas these people do not look upon sharks as dangerous enemies but as guardians and benevolent spirits, as animals which can actually help them. These beliefs were embodied in their traditional religions which, unfortunately, have been largely supplanted and destroyed with the influence of Christian missionaries. In a few isolated areas the religious beliefs involving sharks are still maintained.

"I am curious to know if perhaps, in their special relationship with sharks, island people know anything about them that we don't."

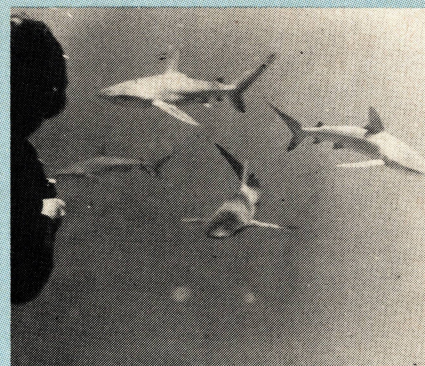
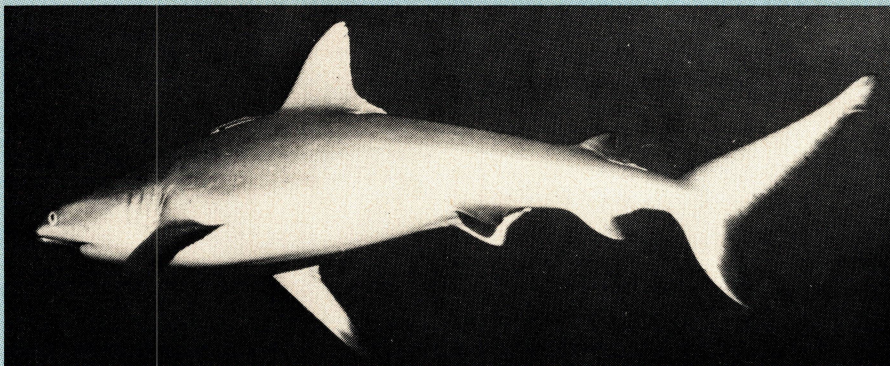
For two months we moved around the beautiful Solomon Islands looking for a group of people who still practiced the ancient shark worship cult once widespread among Melanesian peoples. Everywhere *El Torito* went we found that missionaries had preceded us and the last shark cultists had died out a generation earlier.

Eventually, at Sandfly Passage in the Florida group, we met people who knew something about a sacred shark. They sang a beautiful song about "Tangale," and showed us where he lived in the pass behind the steep cliffs of Tanevula Point. The chief told us that the old people used to make sacrifices to Tangale, who would come when they called him. "If your canoe sank Tangale would save you. Tangale is a good shark. If you see him, just say 'hullo my grandfather, hullo my uncle,' and he won't hurt you." We dived in that pass night and day, hoping to see the sacred shark, but to no avail.

Once Walt speared a good sized cod in the pass. He fastened the bait to the bottom and gray sharks swarmed up current. While Walt was near they would not touch the fish. His zebra striped wet suit seemed to keep them at a distance. Perhaps the suit pattern breaks up the body outline into a series of disjointed bars confusing their vision, especially adapted to perceiving high contrast in dimly lit situations.

We noticed that these sharks could see us before we could see them. The sharks would withdraw just beyond our visual range to a perimeter of their own, their presence only perceptible by an occasional flick of a tail fin or pectoral. Walt's high contrast suit seemed to confuse and frighten them, so that not even a juicy fish carcass could tempt them within camera range. But as soon as he left us, they came in and tore into the bait fish. Then when Walt swam in again, they vanished.

There was no sign of Tangale, but we felt a bit spooked diving in those strong currents. On our first dive, many peculiar things occurred: the first divers down saw a litter of freshly killed fish lying on a cliff ledge — quite inexplicable; and while we were below a sudden squall hit the ship and swung her right out of position. Then, for the first time on the voyage, *El Torito's* diesel motors refused to start. Two divers surfaced down current, in need of assistance, and the skiff's big outboard wouldn't turn over because its starter jammed. And Sandy surfaced in fear after she'd been buzzed too close for comfort by a group of sharks. Six grays kept us under close surveillance



El Torito's crew encountered a number of gray sharks in the aggressive posture shown: body arched, pectorals depressed and head nodding from side to side. In fact, minutes after this shot was taken of Dr. Jerry Allen (right), all divers were forced out of the water. Then Dr. Starck, in his zebra suit, slid into the water and the armada of sharks disappeared.

as we filmed along the cliff face. It's fortunate that we weren't superstitious!

At last we discovered Laulasi Island and were able to study the customs and rituals of the shark worshipping people there. Meanwhile Walt continued his experiments. He tried the idea of wearing a black coat over his suit. When the sharks arrived he divested himself quietly and stood revealed in his zebra stripes. The sharks fled from this weird exhibitionist.

Walt also tested the natives' technique of attracting sharks with a special coconut rattle. He threaded about 20 coconut shells on a hoop of cane so that when shaken they made a clucking sound. First he tried it on the bottom at 150 feet. Not a shark appeared. Then he did exactly as the natives do, holding it over the side of the skiff and agitating it in the water with much splashing. This must provide sound frequencies similar to fish in a feeding frenzy. The water boiled with some 40 sharks and the natives began hooking them one after the other.

The natives believe their ancestors' spirits take the form of sharks. If you catch a spirit shark you will die. So when the sharks come in they call out, warning the ancestor sharks to go to the bottom and avoid their huge wooden hooks. Then they are safe — they only catch wild sharks.

On one occasion, when a huge mob of sharks was milling around the skiff, Walt leapt over in his zebra suit. An eight foot shark came straight for him at lightning speed. It was like a reflex action — exciting sounds in the water, a large solid object, attack. Walt had nothing to defend himself with. Seconds before it hit him the shark must have awakened to the weird color pattern of the suit — it spun around and vanished into the blue.

While at Laulasi village we learned many strange things about sharks from the shark cultists. We found that they have practiced things for a thousand years which we have only learned recently. Beyond that, they know some things which we still don't understand. We saw and filmed sharks appear out of the blue to accept sacrificial offerings, while children swam nearby. Shark attacks on villagers are unheard of, and yet almost every person on the island is an active diver for a major part of his life.

In the streets of Honiara, Guadalcanal, a few weeks after *El Torito* left Laulasi, Walt Starck ran into Johnson Olisokulu, a missionary-educated man from the village. He told Walt that, shortly after we had left, for the first time in his living memory, he had seen the priest pray to the sharks and the sharks had actually appeared with no previous bait or anything in the water. The sharks had come

in and had taken an offering from the hands of the priest.

As Walt said, "We've heard similar stories from other natives and Europeans in the islands, and combined with what we have seen with our own eyes at Laulasi, I think this is probably true. How can it be explained? I am unable to say. There are many things about this universe we don't understand, and this is something which is worth further investigation."

I asked Walt to summarize his thoughts on the shark repellent wet suit and the future of his experimental work. "The statistical probability of being attacked by a shark, for a sport diver who dives occasionally on holidays, is negligible. But for those of us who spend a great deal of time in the ocean, in areas where there are lots of sharks, the probability begins to approach comparably one or one hundred percent. When you are confronted with a large aggressive shark underwater, and you know people who have been attacked and severely injured or killed by them, the problem becomes more than just an academic one.

"In recent years there has been quite a lot of work done on the biology and behavior of sharks, but thus far nothing has come out of it from the practical standpoint of preventing an attack. Some weapons have been developed, but weapons are useless if you don't see the animal — and that's the one most divers worry about, the one they don't see. On coral reefs there's one animal that seems virtually immune to the attack of all predators — the sea snake. With the banded wet suit I attempted to adapt part of his defense.

"Just how effective is the banded wet suit in preventing shark attacks? We can't give an absolute answer to that. We've used it extensively in conjunction with plain wet suits, and the banded suit seems to have a definite effect against the most common and most aggressive reef shark on Indo-Pacific reefs, the gray shark.

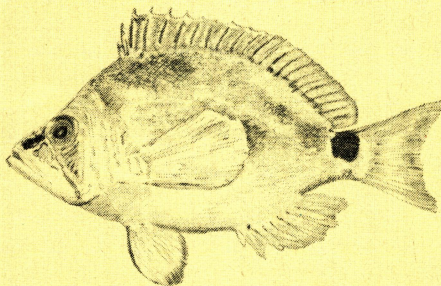
"However, it's going to take a lot of further research to determine the reactions of other species of sharks, and also to find out the optimum configuration of the bands and other such aspects. One of the problems with such research lies in the fact that sharks in a given location get accustomed or conditioned to divers. After awhile they don't behave as they did when you first got there, so it means you have to keep moving the site of your experiments. Other scientists have now picked up the idea and are pursuing this, and the U.S. Navy is doing likewise. In a few years we should have the answer.

"Meanwhile, I'll continue running around underwater looking like an escapee from a Florida chain gang." >

The Butter Hamlet

(*Hypoplectrus unicolor*)

With the butter hamlet, it's the spot that counts. While many hamlet species sport significant black saddle-like spots at the base of the tail during their juvenile stages, there is no other hamlet that maintains the spot during adulthood. Since hamlets are primarily categorized by their color patterns and markings, this spot makes the identification of the butter hamlet an easier task. □ The butter hamlet, simply referred to as "Hamlet" by some ichthyologists, is very similar to *Hypoplectrus puella* (the barred hamlet, SDM, Dec. 1973). The butter hamlet, *H. unicolor*, does not have bars. Overall the fish is yellowish gray, becoming almost white ventrally. The barred hamlet does have a spot at the base of the tail during the juvenile stage, but loses it later in life. Many hamlets have a blue-edged black spot on the snout; very often the butter hamlet has this feature, too, even though it is missing on our pictured specimen. The butter hamlet has several iridescent blue markings on the head, as does the barred hamlet, and the fin coloration of the two fishes is similar. □ Where the barred hamlet is the most common hamlet in the West Indies, the butter hamlet is rare in the West Indies but common in the Florida Keys. At one time all of the hamlets were thought to be different color phases of one hamlet and were referred to as *H. unicolor*. Ichthyologists now agree that the different hamlet species are distinguished by their individual markings and colorations. While there might be slight



variations in color patterns within a single species, there is never a case where a hamlet could bear markings that look halfway between one species and another. □ Hamlets belong to the Serranidae family of sea basses and groupers, although some ichthyologists would like to classify them separately because of their unique characteristics that separate them from the rest of the family. Hamlets are small, compressed serranids, with deeper, foreshortened bodies. Where most serranids stay on the substrate, the hamlets

swim a few inches off the bottom in moderately deep water (40 to 75 feet). Normally they stay close to some sort of shelter. Early ichthyologists reported that hamlets were curious fish, but modern day divers often find them a bit shy and skittery. They become less inhibited when it's time to eat. Their main

diet consists of small crustaceans such as shrimp and crabs; Dr. John Randall has found that the hamlets also eat small fishes, polychaetes and stomatopods. While serranids feed day or night and are generally active, hamlets are known to rest after the sun goes down. □ The sex life of the hamlet is a bit of a story in itself. These fish are hermaphroditic — male and female at the same time. Ichthyologists have found both male and female organs, with fertile eggs and sperm, in the roe of a single fish. Conceivably the fish could impregnate itself, but this is unlikely. Ichthyologists have found in studying hamlets, that spawning is usually a group affair. ➤

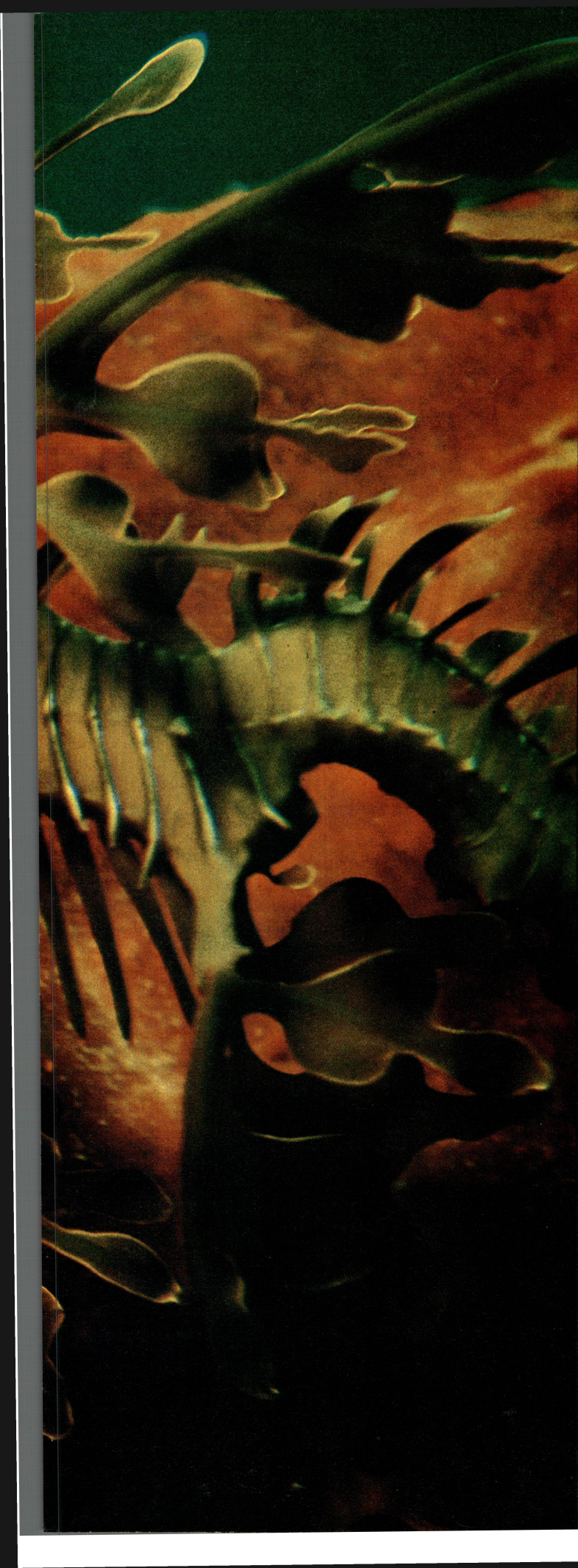
Photo By Paul Tzimoulis — Text By Hillary Hauser Anderson

Photo taken in 35 feet of water off Curacao. Tzimoulis used a Nikon F camera and 55mm Micro Nikkor lens in a Niko-Mar housing, 6B flash bulb, Ektachrome X, 1/125 sec., f22, 14" from subject.



Ocean Gallery





A Tale Of A Sea Dragon

By George Dubas

One of the nicest things about underwater photography is that excellent subject matter often turns up when one least expects it. Over the years, I have spent a considerable amount of time frequenting the location reputed to be home for many leafy sea dragons without ever seeing a single specimen. Then, far removed from this purported sea dragon haven, and several miles offshore from the little South Australian township of Edithburg, I at last found myself, quite unexpectedly, eye to eye with the most beautiful and graceful piece of self-propelled seaweed imaginable — *Phycodurus eques* in all its grandeur.

Until recently, the leafy sea dragon was considered to be a true rarity among fishes: not only was its distribution restricted to South Australia, but its small mouth prevented this fish from being hooked and its preference for rocky localities effectively safeguarded it from capture in nets. With the advent and proliferation of skin and scuba diving, however, sightings and capturings have become somewhat more frequent. But the study of this amazing creature still will remain a privilege for divers, because the leafy sea dragon is an extremely delicate fish which rarely survives more than a brief period in aquaria.

The leafy sea dragon, which grows to a maximum size of about 11 inches, is a relative of the sea horse, *Hippocampus* — but it differs from sea horses in its breeding habits. As is well known, the male *Hippocampus* has the task of mothering his family. To facilitate this function, the male has a brood pouch on the belly portion of his body into which one or several females place eggs. After the eggs have developed, the father goes through a series of spasms which result in as many as 300 miniature sea horses being forced out of the pouch.

In the case of the leafy sea dragon, the female also relinquishes her responsibilities after she has laid her eggs. The male, however, does not have a brood pouch, but instead develops a brood patch — a soft mucous membrane on the region beneath the tail to which the eggs adhere. Such a creature carrying eggs is indeed a striking sight, for the eggs are a beautiful ruby color, each about the size of a pin's head, and a single male may carry 100 eggs or so.

Instead of scales, the leafy sea dragon is covered with jointed, bone-like plates which permit very little freedom of body movement. This jointed armor limits movement to the gills and fins, which makes the leafy sea dragon a very weak swimmer, hampered even further in speed by its large and numerous appendages. But it is those same appendages which tend to render it a remarkably inconspicuous creature when it hangs motionless among bottom weeds. In fact, a zoologist once wrote, "If this is development, it stopped here just in time — one step more and it would have been a bunch of kelp."

As well as being the most beautiful fish I have ever photographed, the leafy sea dragon tends also to be among the most difficult subjects. From the moment it decides it no longer desires to be the object of attention, the sea dragon takes leave. Although its attempts to outswim the photographer are futile, it nevertheless makes things quite frustrating by altering direction at the right moments so that no matter how hard one tries to get a well composed shot, all that one can see in the ground glass is . . . a tail of a sea dragon! 🐉

photograph by Author

A SECOND

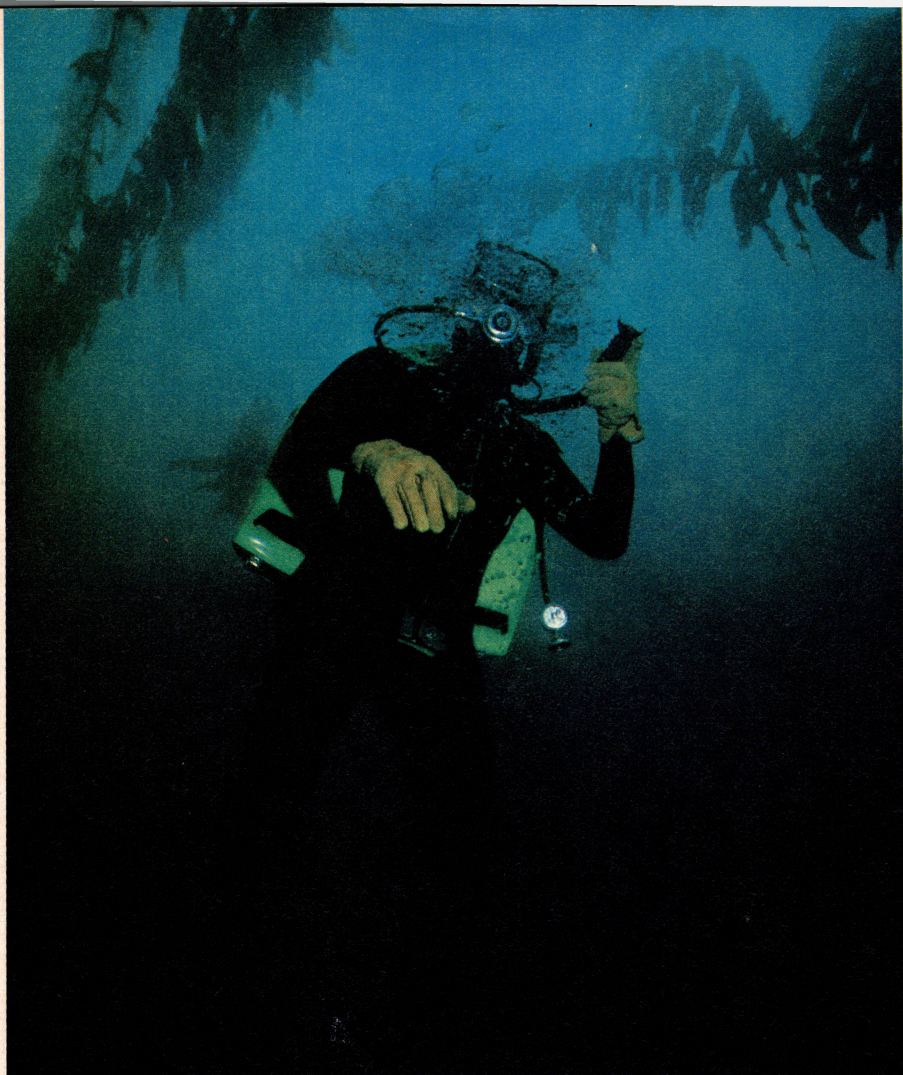
By Lou Fead

Two years have passed since the At-Pac was introduced to the sport diving world by Watergill, Inc. In those two years, thousands of divers have bought the At-Pac for their personal use. Many more divers were introduced to it by the June, 1972, issue of SKIN DIVER which featured the At-Pac as a "revolutionary back pack." The article described the At-Pac as a single unit combining the operational features of an air-supplied buoyancy vest, a back pack, and a weight belt.

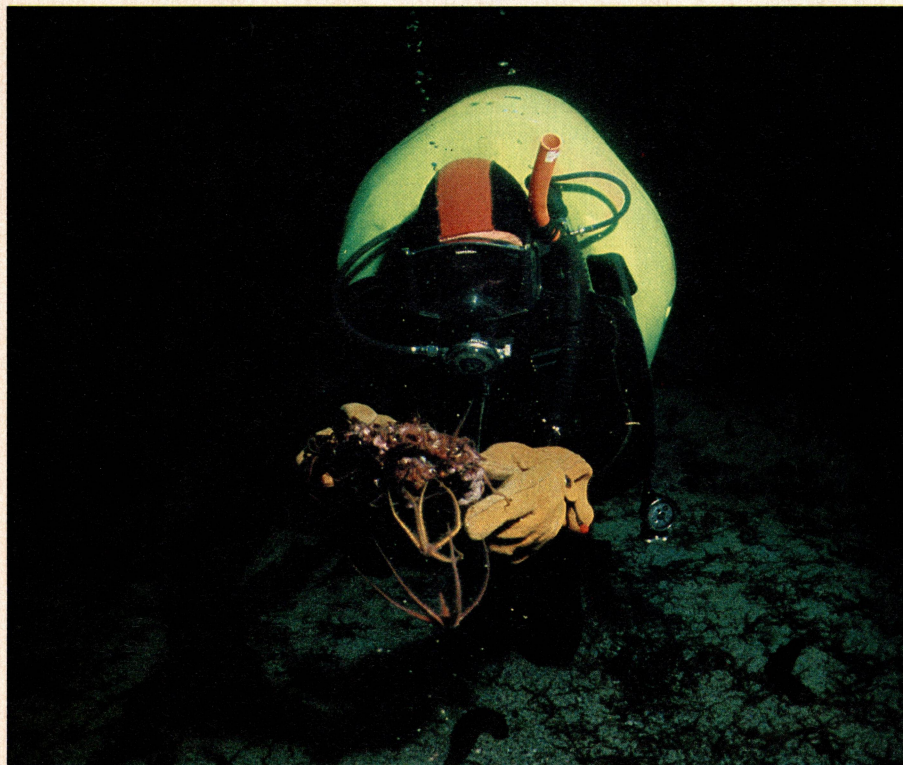
The current model of the At-Pac, much improved internally, still provides the basic benefits which delighted the early users: easy surface snorkeling maneuverability of the heaviest diving equipment, elimination of strap clutter on a diver's body, and push-button buoyancy control.

Talkative divers have heartily endorsed the opportunity for continual surface conversation before the dive, after the dive, and even when penetrating the surf, that comes from the surface handling characteristics of the At-Pac. Little and big divers, who previously suffered with overlapping and hidden straps from equipment built for the "standard" diver, have delighted in seeing their toes and waist strap, all at the same time. Photographically inclined divers have been happy that the At-Pac's single-handed submerged buoyancy control releases them from diving chores to concentrate on their photographic fun. Such was the "revolution" in sport diving fun.

Many facts and fictions about the At-Pac have since been generated by those who know and those who don't. To clear the air and separate fact from fiction, let's take a look at the pros and

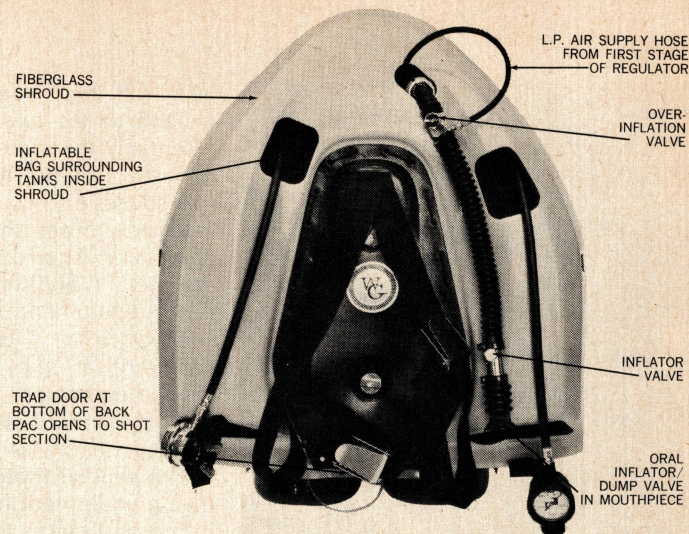


At-Pac proponents claim a main advantage of the system is the ease of descents and ascents for properly weighted divers. While on the bottom, neutral buoyancy can be maintained with one hand even if a diver has picked up goodies.



photography by Jack McKenney

LOOK AT THE AT-PAC



The At-Pac combines features of a back pack, a buoyancy vest and weight belt.

cons of the At-Pac system of diving.

The proponents of the At-Pac point to every phase of a dive to extol its virtues. The At-Pac diver can comfortably carry all his diving gear at the same time to the dressing area by wearing his At-Pac, carrying his gear bag in one hand and his tank in the other, for balance. Assembling the gear and getting dressed takes much less time and is easier since there is no need to separately don a vest, then a tank, then a weight belt.

Entering the water from a boat is simple because the inflated At-Pac can be thrown in first, then the unencumbered diver can follow, without the balance problems caused by the ocean motion of the boat. Entering through the surf becomes a breeze by dragging the At-Pac through, or, by floating face up and kicking after shuffling out to the surf.

Snorkeling, as the older diver knows it, disappears when traveling backward on an At-Pac. Snorkeling face down also becomes easier because the tendency to roll over caused by the tank-vest-weight buoyancy relationship does not exist. Resting is more effective since the At-Pac leaves the diver in a comfortable snorkeling position, or on his back, or in a nearly vertical position, if that is his choice—or completely free if he has it off.

The proponents continue with the submerged capabilities that enthrall them. Easy rapid vertical venting of the buoyancy bag, coupled with a deep exhale, quickly takes the properly weighted diver beneath the surface. One hand operation of the inflator valve controls the diver's descent such that he can arrive at the bottom, regardless of

depth, nearly perfectly trimmed for neutral diving. It's great to be in control of a descent without kicking fins!

Buoyancy adjustment on the bottom can be done, still with one hand, while the diver is shooting photos, stalking lobsters, gliding through kelp, or marveling at the beauty of a vertical wall. That adjustment can include maintaining neutrality while picking up about 30 pounds of goodies to return to the surface world. Ascent is a no-sweat-no-kick evolution accomplished by adding a slight amount of positive buoyancy to start, then controlling to that same positive buoyancy during rising by venting the excess expanding air.

The At-Pac opponents have raised some points of discussion that deserve serious consideration, because they involve the basic approaches to diving.

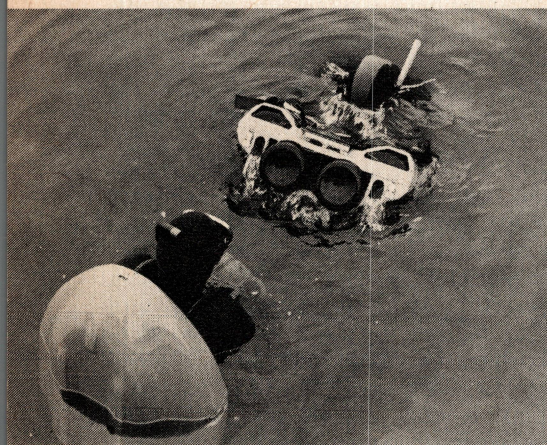
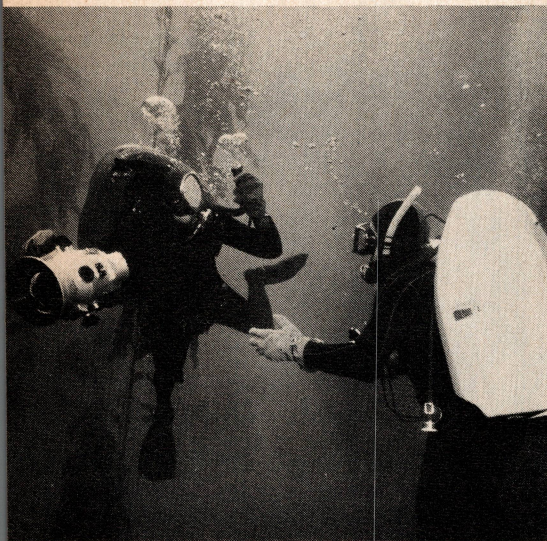
The observant diver notices early in his examination of the At-Pac that the internal weights can be jettisoned only when the top of the At-Pac is higher than the bottom. The weights will not fall out if the trap door is above the weights; that is when the diver is in a head down position. That raises the question, "How do you drop the weights in an emergency when your head is down?" The answer is that the weights needn't be dropped in an emergency. The At-Pac's buoyancy bag can be inflated, in any position, to a total of about 60 pounds of lift, which is considerably more than a dropped weight belt can provide. In fact, a neutrally compensated At-Pac diver, unless he is quite deep, can gain increasing positive buoyancy easily by ascending a few feet to make the air in his buoyancy bag expand.

A continued discussion of the At-Pac's weight-dropping characteristics leads to the "out-of-air" diver who cannot inflate his At-Pac and still needs to drop weights. The simplest solution for that situation is to jettison the whole At-Pac, which he can do quickly because the releases are always clear. Jettisoning the At-Pac is accomplished by unfastening waist and shoulder quick release buckles, turning slightly right toward the pack, and slipping the right arm out of its strap.

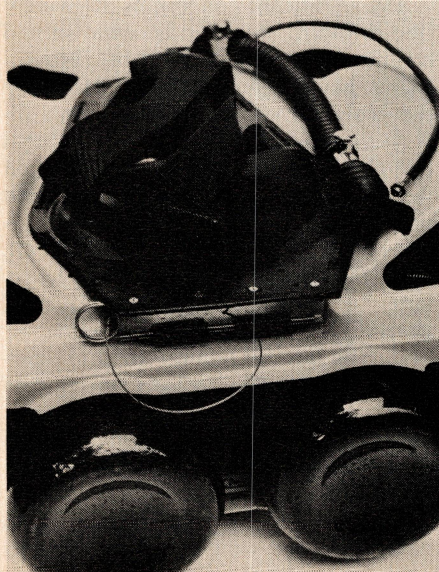
But, what about the lead shot in the At-Pac; why not drop it? Dropping shot is done mainly on the surface when the buoyancy bag has been rendered useless in some way. If entanglement is the reason for dropping the belt, it should be obvious that dropping the At-Pac with tank would be more effective because it is probably the tank that is entangled.

The significant concern in the weight belt dropping question is: what should a diver do when he is in distress? Many have been instructed to drop the weight belt, but that doesn't always work. Accident studies show that panicked divers do not drop their weights. Divers without wet suits often don't wear weight belts to drop. A diver wearing only a light weight belt, as in the case of the diver with heavy tanks or natural negative buoyancy, gains little buoyancy by dropping his belt. The proper action in an emergency is to think, "What's wrong and how can I fix it?"

At-Pacs are too heavy! Obviously, if a diver picks up his At-Pac system assembled for diving, he'll call it heavy. Similarly, if he picks up his tank, back pack, vest, and weight belt all at once,



Divers Bernie Campoli and Bill Miller tried the At-Pac in open water. They found it easiest to put the unit on in the water, letting it slip over their heads. Lead shot weights are held in the unit by a trap door, shown below.



he'll call that heavy, too. The total weights of the two diving systems are essentially the same, so it can't be said honestly that the At-Pac is too heavy. It is suggested that the tank be carried separately from the At-Pac for handling ease. After donning, however, all the weight and inertia of the heavy diving equipment can be instantly jettisoned from a diver through two-buckle releasing of the At-Pac. The jettisoned equipment is not lost, as in the case of standard systems, because it is floating nearby as a recoverable unit.

The general thought in diving is that diving equipment has been considered in bits and pieces too long, as noted in the initial University of Rhode Island sport diving accident study. The At-Pac represents the first real integration of sport diving equipment to reduce the incompatibilities of the separately designed equipment essentials.

The opponents' argument which merits detailed attention is that which concludes a vest is superior to the At-Pac because it will float an unconscious diver face up on the surface instead of face down, as the At-Pac supposedly would. Let's imagine the situation which could include a diver floating unconscious on the surface. Such a situation has immediate drastic consequences if the diver is unassisted by anybody or any buddy.

If a diver is alone, and unconscious, the position and condition in which he floats depends on the type of vest worn, how it's worn, and the position of the diver when he passes out. To set a general conclusion for vests would be folly. Each diver should evaluate his own vest by completely relaxing with lungs about half full, to simulate an unconscious diver, and letting the vest determine how he floats. Experience has shown that, even though a lot of the vests tend to turn the diver face up, many do not support the mouth out of the water.

For the diver who passes out underwater and ascends unconsciously, the final floating condition is a matter of chance and equipment. If the vest is partially inflated on ascent, it may be over expanded, according to Boyle's Law, and ruptured by the time it reaches the surface (unless it has an overpressure relief valve, in which case it will be fully inflated). Pool and ocean testing of relaxed divers ascending with no physical control concludes that the final position cannot be predicted; that it is only luck if the diver's mouth is out of the water.

The At-Pac performs as well as many vests in this regard: sometimes face up, sometimes face down, but usually on the side. The difference comes when a buddy is near to assist. The At-Pac's buoyancy provides an unencumbered access to the unconscious diver, who can easily be rolled on his back and maintained in a face up condition with his mouth out of the water, with no effort other than inflating the buoyancy bag and rolling the body.

A few minor objections usually included in an opponents' discussion of the At-Pac are: it is hard to get into on dry land, its weights stick together and won't drop even if released, and it costs too much.

Donning the At-Pac is relatively easy, if the diver utilizes the technique that best fits his capability. Some divers set the At-Pac on a bench, then back into the gaping shoulder straps, snug up the waist strap and stand up. Others sit into the At-Pac when it is on the ground, adjust the straps, then roll to the side to stand up; while there are even some who lie flat on the pack to adjust the straps, then roll to stand up. Any method seems easier to me than the hassle of donning a vest, then a tank, then a weight belt.

The supposed "sticking together" of the lead weights and marbles may occur if the At-Pac is over-stuffed with those items, in violation of the recommended loading procedure. Each pre-dive check includes shaking the At-Pac to ensure the weights are loose.

The cost concern should disappear with two thoughts. One, the cost of the vest-pack-belt system with somewhat the same features, but lacking the integrated capabilities and convenience of the At-Pac system, is generally only about one fourth less. Some combinations even cost more than the At-Pac. Two, for many divers the At-Pac represents the Cadillac of sport diving systems, and you can't get a Cadillac at Camaro prices.

The At-Pac represents a step change in diving equipment caused by the demands of thinking divers. Divers will continue to see more change because all manufacturers of diving equipment are continuing to respond by designing, building, testing, and distributing new and more efficient diving systems for the pleasure of the diving public. It pays in increased enjoyment for every diver to constantly monitor and personally evaluate the continued progress of sport diving equipment. >#

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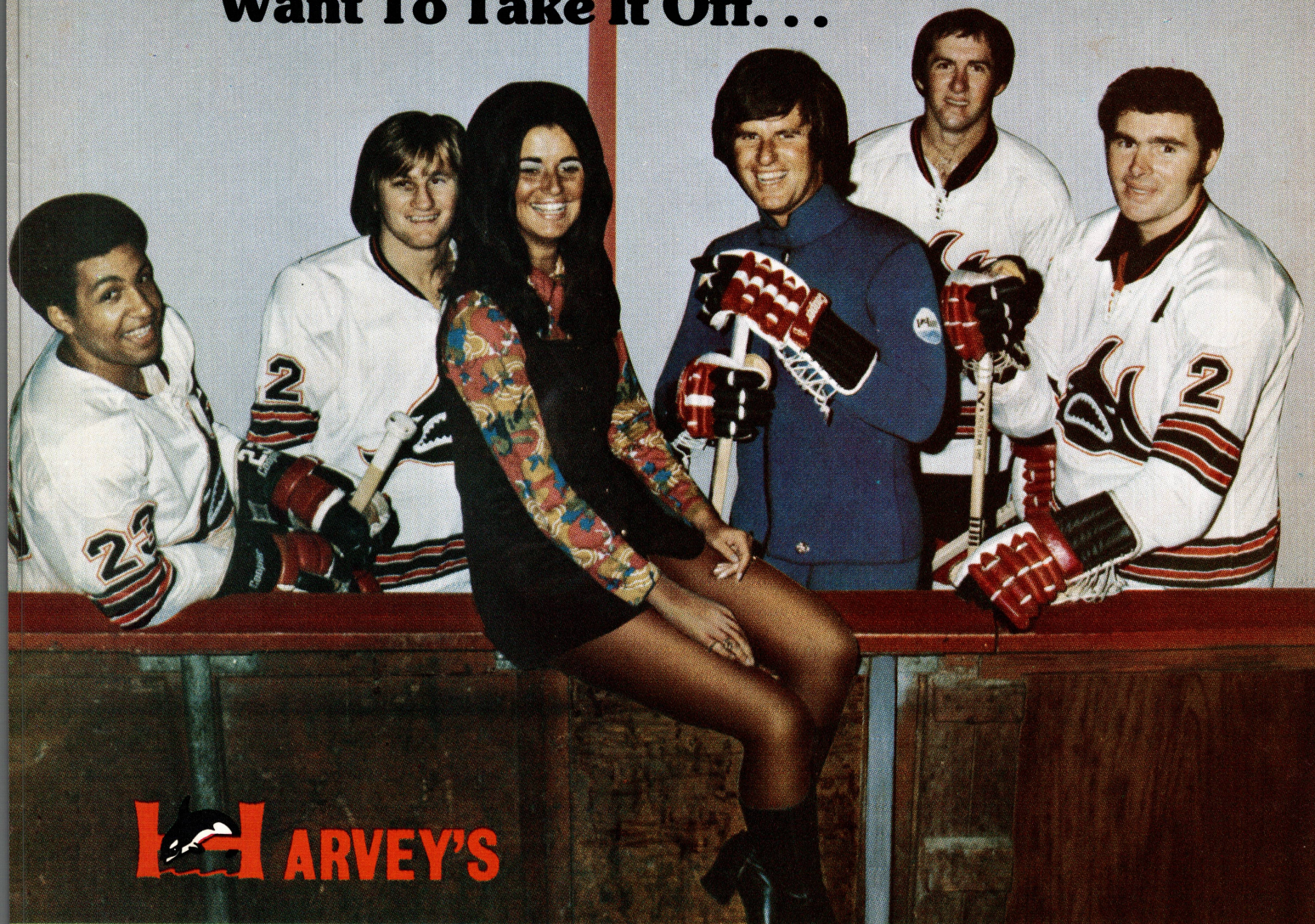
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